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A TREATISE ON

GOUT

AND

RHEUMATIC GOUT.

(RHEUMATOID ARTHRITIS.)

BY

ALFRED BARING GARROD, M.D., F.R.S.,
Fellow of the Royal College of Physicians; Consulting Physician to King's College Hospital;
Late Professor of Therapeutics at King's College, London.

> “Observez la nature, et suivez
> la route qu'elle vous trace.’
> J. J. ROUSSEAU.

THIRD EDITION.

THOROUGHLY REVISED AND ENLARGED.

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TO

SIR THOMAS WATSON, BART., M.D., F.R.S.,
HON. LL.D., CANTAB., HON. D.C.L., OXON.,
PHYSICIAN IN ORDINARY TO THE QUEEN.

◆

DEAR SIR THOMAS,

SEVERAL years have passed since I had the pleasure of dedicating to you the Second Edition of the present work—years which have brought—to you increased, but well-merited honours—to me an enlarged experience. I trust that this experience has not been altogether without good influence on the changes which mark the present edition of the book, which I am most happy to be still able to dedicate to you.

I am, dear Sir Thomas,

Yours very sincerely,

A. B. GARROD.

May, 1876.

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PREFACE

TO THE THIRD EDITION.

THE fact that this work has been out of print for several years is sufficient justification for the appearance of a new edition. During the somewhat long interval which has elapsed since the publication of the Second Edition, the author has had a very extensive experience in both the diseases comprehended in the title of the work, the practical results of which he has endeavoured to incorporate in the present volume, although he has had neither space nor leisure to enter fully into many interesting details of which he possesses the records.

Of the French and German translations of the work, the author has found the former particularly valuable, and feels it incumbent on him to acknowledge his obligations to the numerous original notes appended by Dr. Charcot, of Paris, whose investigations on the subject are of European celebrity. The author has not hesitated in the present edition to make use of these notes, and he has also introduced some of the graphic drawings from the supplemental plates in the French work.

In conclusion, the author is happy to think that further experience has in no way led him to alter the views which he put forward in his first edition, in 1860, as the result of his early investigations.

10, HARLEY STREET, CAVENDISH SQUARE, W.,
May, 1876.

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ON GOUT:

ITS

NATURE AND TREATMENT.

CHAPTER I.

INTRODUCTORY REMARKS:—KNOWLEDGE OF THE ANCIENT WRITERS UPON THE SUBJECT OF GOUT—VIEWS OF HIPPOCRATES—CELSUS—GALEN—ARETÆUS—CÆLIUS AURELIANUS—ALEXANDER TRALLIANUS—AËTIUS—PAULUS ÆGINETA—DEMETRIUS PEPAGOMENOS—THE ARABIAN PHYSICIANS—THE PRINCIPAL AUTHORS OF THE 17TH AND 18TH CENTURIES—CLASSIFICATION OF GOUT ADOPTED BY DIFFERENT AUTHORS—AUTHOR'S DIVISION.

GOUT is a malady fairly entitled to boast of its great antiquity, as it was probably one of the earliest diseases to which flesh became heir when man began to participate in the luxuries of civilised life: it is a disease, also, which can lay claim to having had among its victims some of the most renowned of the human race, from their position, opulence, and intellect. The great Sydenham, often styled the English Hippocrates, himself a martyr to gout, thus alludes to those most liable to be affected by it:

"For humble individuals like myself there is one poor comfort, which is this, viz., that gout, unlike any other disease, kills more rich men than poor, more wise than simple. Great kings, emperors, generals, admirals, and philosophers, have all died of gout. Hereby Nature shows her impartiality, since those whom she favours in one way she afflicts in another—a mixture of good and evil pre-eminently adapted to our frail mortality:

> "'Nihil est ab omni
> Parte beatum.'"

Among nations in an uncivilised state, living chiefly on the produce of the chase obtained by personal exertion, or subsisting on the simplest fare, gout, according to the reports of eminent travellers, is entirely unknown; but in our own country, and in many other parts of the civilised world, the case is far otherwise; for not only is gout in its most marked and typical manifestations exceedingly prevalent, but in its lurking and undeveloped forms it is probably still more so, and exercises a considerable influence over the character and progress of other disorders.

It is therefore obviously a matter of the highest importance that the disease should be clearly understood in all its bearings.

A further reason for the necessity of an accurate study of gout, is the fact, that errors in distinguishing it frequently occur, not only as regards its less marked forms, but even its most common manifestations. It is by no means rare, to hear of inflammation of a joint, by one practitioner called gout, by another rheumatism, and by a third rheumatic gout; and such discrepancies of opinion, of the highest importance in treatment, often arise from the difficulty of clearly distinguishing its true character on account of our imperfect knowledge of the malady. As we proceed, we shall be able to demonstrate beyond doubt, that gout is a disease *sui generis*, having a pathology of its own, and producing alterations in the various tissues which it attacks, differing from all other changes, — alterations, indeed, which are completely pathognomonic.

If difficulties arise in distinguishing the more regular forms of gout, they are greatly increased when its irregular manifestations require to be discriminated. Although in a highly gouty state of the system, functional disturbance of various organs, and even inflammatory affections may and do arise, depending upon such morbid state,—conditions whose real nature it is most important to determine accurately,—still in practice, even at the present day, the term *gouty* is not unfrequently applied, more to quiet the patient and satisfy the mind of the physician, than from any evidence that the disease under consideration is strictly connected with gout; for it must be remembered, that the occurrence of gout does not ensure exemption from any other malady, and the latter, when it arises, has no necessary relation to the former. A careful perusal of the writings of some of the authors of the last and commencement of the present century, must convince every thinking mind that many of the forms of gout so elaborately described, especially by Continental physicians, have no real existence in nature.

It will be one object of the present treatise to endeavour more clearly to point out and separate those affections which are distinctly traceable to the gouty diathesis, to found their diagnosis on a more philosophical basis, and thus to pave the way for a scientific and successful treatment.

That the ancients were fully cognisant of the phenomena of gout, and in fact that it was one of the disorders the nature and treatment of which were best known to them, is at once evident from a perusal of their writings. It is true that an undue stress was frequently laid upon the mere seat of the affection, and that various names were not uncommonly applied to the same disease in its different local manifestations, and also that the same name was often given to maladies of a very diverse character; but this should not surprise us, considering their total ignorance of even the rudiments of some of those sciences which are essential to a clear understanding and separation of different pathological conditions of the body. Gout and rheumatism were doubtless at times confounded with each other by the Greek physicians, a remark also applicable to some pathologists of the present day; however, although the same general term was applied to both diseases, still it is manifest that true gout was by most of them separated from other joint affections, its peculiar phenomena and progress clearly defined, its various causes ascertained, and its treatment, dietetic and medicinal, carefully laid down.

The Greek physicians gave different names to the affection, according to its situation; for example, when the foot was attacked, it was named Podagra (ποδάγρα, from ποὺς, the foot, and ἄγρα, a seizure); when the hand, Chiragra (χειράγρα, from χεὶρ, the hand); when the knee, Gonagra (γονάγρα, from γόνυ, the knee); when many joints were simultaneously affected, the term Arthritis (ἄρθρον, a joint) was more commonly applied. The word gout appears to have been introduced into medicine about the end of the thirteenth century, by Radulfe, and it probably owes its origin to the idea which has been very prevalent in all ages, that the disease is caused by the presence of some peculiar humour in the blood, which is thrown out, or, as it were, distilled into the joints drop by drop; and hence in different modern languages terms expressing the same notion are employed, terms in fact corresponding to our word gout; thus, by the French the disease is called "Goutte," by the Germans "Gicht," by the Italians "Gotta," and by the Spaniards "Gôta," and so forth.

The writings of Hippocrates, who lived about 350 years before the Christian era, show that he was well acquainted with gout, and many of his aphorisms indicate the possession of a considerable knowledge of this disease. We find it stated, for example, that gouty affections are most troublesome in spring and autumn; that women do not have gout until the catamenia have stopped; that young men are free from the disease till venery is indulged in, and that eunuchs are exempt from gouty affections. It is likewise affirmed that gouty patients who have chalk-stones in their joints, and have led a hard life, are beyond the power of medicine, but that under other circumstances the disease may be cured by the skilful physician. He considered the disorder as dependent on the retention of humours, and advised purging, and the application of cooling agents, even going so far as to pour cold water on the inflamed foot. Although we cannot subscribe to all that Hippocrates advanced, still we must agree in his general truthfulness; and it must be borne in mind that some of his aphorisms were more correct at the time they were enunciated than at subsequent periods, as luxurious habits had not then been so freely indulged in.

Celsus, about the beginning of the Christian era, in speaking of the treatment of gout, remarked that bleeding at the commencement of the attack had the effect of causing some patients to be free from the disease for a year, some even for life; he also recommends either cold or warm applications, depending on the presence or absence of inflammatory action. He, however, enjoins some caution with regard to cold applications, and recommends a regulated manner of living and the avoid-ance of corpulence. With regard to the value of exercise, he remarks, "it is very necessary that those who are troubled with nervous pains, such as happen either in the gout of the feet or hands, should give the parts affected as much exercise as possible, and should expose them on all occasions both to fatigue and cold."

Galen, who lived about the latter half of the second century, was of opinion, that gout was caused by some unnatural accumulation of matters in the part affected; these matters were supposed to consist of phlegm, bile, blood, or a mixture of these fluids, and chalk-stones were considered to be formed by their concretion or solidification. In his comments on the aphorisms of Hippocrates, he remarks, that though in the time of Hippocrates eunuchs were not afflicted with gout, yet they were so in his day in consequence of too much sloth and intemperance. Galen's method of treatment consisted in bleeding and purging, and the application of repellents and discutients.

Seneca, in his epistles, alluding to the influence of change of manners and habits, as exemplified during the Roman Empire, on the liability to certain diseases, says: "The nature of women is not altered, but their manner of living; for while they rival the men in every kind of licentiousness, they equal them too in their very bodily disorders. Why need we then be surprised at seeing so many of the female sex afflicted with gout?"

Aretæus, the Cappadocian, who probably was a contemporary of Galen, and wrote about the middle of the second century, classified all joint affections under the term Arthritis, yet subdivided them, according to the parts attacked, into Podagra, Chiragra, and so forth. That he had a very clear conception of true gout, and was familiar with many of its phenomena, is evident from his account of the manner in which it makes its invasion. He remarks that the pain first seizes the great toe, then the forepart of the heel on which we lean, next the hollow of the foot, afterwards the ankle; he also states that a wrong cause, such as the friction of a new shoe, a long walk, a blow, or other injury is often assigned, and that patients are unwilling to recognise the true one. He goes on to relate that sometimes the disease is confined to the feet during the patient's life, but that it more often extends to the hands, elbows, knees and even the hips; that fluid deposits are sometimes formed which afterwards become converted into hard white tophi. It is also noted by this writer, that men are more frequently affected than women, and at the same time more slightly (this last statement, as far as true gout is concerned, is certainly erroneous); that the most common age is thirty-five, but that it may be sooner or later according to the temperament of the individual: as to the nature of the disease, Aretæus says, none but the gods can truly understand it. With regard to his treatment of gout, the following summary contains all that is important. White hellebore is the great remedy, but only in the early attacks. As local applications to the inflamed joints, he advises fresh-shorn unscoured wool from the sheep, and the parts to be bathed with oil of roses and wine; poultices and other warm agents are likewise recommended to be occasionally used. He further adds, that the remedies for the disease are innumerable, for the calamity renders the patients themselves expert druggists. Aretæus considers that although the disease is apt to return and become chronic, still it is not always so, and he mentions that a gouty patient has, during the interval of the disorder, even won the race in the Olympic Games.

Cælius Aurelianus looked upon gout as hereditary, and upon indigestion, intemperance, cold and debauchery, as the principal causes; he observed that the symptoms usually attending persons afflicted with the diathesis, or those preceding an attack, were a numbness and pricking in the affected joints, difficulty in flexing and extending them, heaviness, great aversion to employment, feeling of great fatigue from the least movement, starting of the limbs during sleep, and shivering, until the morbid humour at last discharged itself upon one or other foot. He was of opinion that the disease was chiefly seated in the tendons and ligaments, and for treatment advised the abstraction of blood from the affected parts by scarification, as less irritating than cupping or leeching, and recommended sponging with hot water, or oil and water, or decoction of fenugreek. As a rule, he considered that powerful purging and vomiting were injurious, and altogether was inclined to be sparing in the use of remedies; he was, however, rigid as to diet, advising great abstinence at the commencement of an attack, and a spare diet on its decline; he also advocated the free use of exercise.

Alexander Trallianus, who wrote in the sixth century after Christ, considers that, as there are many causes, so likewise there are many varieties of gout; that sometimes it is occasioned by blood flowing into the joints and causing violent pains; at other times by bile getting between the tendons and ligaments; and now and then by the presence of other morbid fluids. He gives methods of diagnosing these supposed varieties, and details their treatment at some length; when the disease is dependent on an overflow of blood, bleeding is ordered, but not otherwise; food capable of producing blood is forbidden, and strict temperance enjoined. He states that he has known patients to have been altogether cured by abstaining from wine. Purgatives are prescribed, especially combinations of scammony, colocynth, elaterium, and aloes, also the hermodactylus, a variety of colchicum, the prejudicial effects of which are ordered to be obviated by combining it with aromatics, as myrrh, anise, pepper, cinnamon, ginger, and mastich. Bitters of various kinds are also recommended, amongst which is the birthwort, afterwards so much used in the celebrated Portland powder. Amongst local applications, we find sinapisms and blisters advised, as well as repellent lotions; and for the treatment of chalk-stones, ointments containing oil, turpentine, ammoniacum, dragon's blood, and litharge.

Aëtius, who also lived at the end of the fifth or beginning of the sixth century, considered gout hereditary, and dependent on local debility, combined with a superabundance of humours; that it was most appropriately treated by first evacuating the latter by bleeding and purging, and afterwards strengthening the weakened part. He also attributed great efficacy to the use of friction in gout, not indeed during the severity of the inflammation, but when this had to a great extent subsided; he employed oil mixed with salt as an external application.

Paulus Ægineta likewise considered gout dependent on two combined causes, weakness of the affected parts and morbific humours, the latter fixing themselves upon joints already weak, and by stretching the ligaments, producing pain. Ægineta regarded gouty and rheumatic, or arthritic complaints, as of the same nature, but differing in the seat of the affection; when it was located in the feet only he called it Podagra, but when extensively diffused over many joints, Arthritis; he also thought that the abnormal humours might vary in character, and that by their becoming thick or viscid, tophi or chalk-stones were formed. Among the causes of the disease he enumerated immoderate labour, violent walking, frequent exercise on horseback, the unseasonable use of venery, cold drinks, eating unwholesome food, and drinking much wine; and he remarks that occasionally accidents, as blows or sprains, have induced the first attack, the materials of the disease having previously remained quiet in the system. Sorrow, care, watchfulness, and other passions of the mind, he also looked upon as occasional causes of gout.

In the middle or latter half of the thirteenth century, Demetrius Pepagomenos wrote a treatise on gout, dedicated to the Emperor Michael Paleologus. He considered the disease to be occasioned by a collection of humours taking place in the affected joints, arising from imperfect digestion and deficient excretion from the system: the predisposing causes being excess of food and wine, indolence, indigestion, retention of natural secretions, fatigue, and exhaustion produced by any cause which operates by diminishing the excretory powers of the system, and allows undue accumulations. His treatment is both dietetic and medicinal: the former consists in avoiding indigestion, and exercising great moderation both in eating and drinking; the latter is chiefly of an evacuant character, either vomiting or purging. During the early stage of a fit of gout, venesection is recommended, especially when the patient is plethoric. The virtues of the hermodactylus combined with aromatics are much lauded, and regarded as valuable, whatever may have been the cause of the disease.

Dr. Adams, in his valuable notes appended to the translation of Paulus Ægineta, gives the following sketch of the views of the Arabian physicians. Serapion strongly recommends purging with myrobalans, prunes, and tamarinds; Avicenna and Rhases join him in praising the virtues of the hermodactylus. The local applications of the Arabians are similar to those of the Greeks: when the pain is violent, Serapion approves of pouring cold water upon the affected part; Rhases of burning the joint; Avicenna of covering the part with oil and salt, and then applying the cautery. According to Haly Abbas, arthritic diseases are due to collections of superfluities in joints labouring under debility, the superfluities being produced by repletion and indigestion; the debility, by immoderate exercise, intemperance, debauchery, or some such cause. He states that young persons, and women who menstruate regularly, are scarcely liable to gout, and agrees with the authorities already mentioned in holding it to be hereditary.

When chemistry emerged from alchemy, and was first applied to the study of medicine, many opinions as to the nature of these morbid matters were promulgated; for some time they were regarded as being of a tartareous character, in many respects resembling the tartar which concretes in the wine casks. These views were held during the seventeenth and eighteenth centuries, in fact, until the discovery of the true nature of gouty concretions by Wollaston. M. Coste in his "Traité pratique de la Goutte," 1768, sums up the ideas commonly entertained as to the nature of the gouty matter. Some, he says, suppose it to be a mixture of various excrementitial humours, differing in their qualities and uses; others, a collection of foreign matters, altogether heterogeneous, and by their union capable of producing this malady; a third class think it merely the perspiration arrested and decomposed; a fourth that it is a mucilaginous extract derived from the solid and liquid aliments taken into the system; and lastly, some assure us that it is a combination of many subtle and penetrating salts. Hoffman considered that a salt of tartar exists in the blood of the gouty, and constitutes the principal cause of the disease; to prove which, he cites several analyses of the concretions taken from the joints of gouty patients, as also of their excrements, saliva, and urine, and is persuaded that the tartar of wine is the essential matter of gout. M. Coste contends that Hoffman's opinion must be incorrect, seeing that gout follows almost all other ailments, and causes them to disappear, and hence from such reasoning, tartar must also be the cause of all these maladies,—an opinion, says he, manifestly absurd; and again he asserts, that gout is not uncommon among those who never drink wine, and who, therefore, do not take tartar; nevertheless M. Coste is inclined to think that it is one cause of the disease. During the two last centuries, the most important writers on gout were Sydenham, Willis, Hoffman, Musgrave, Cheyne, Boerhaave, Meade, Van Swieten, Cadogan, Forbes, and Heberden; but as we shall have occasion to refer to the writings of some of these physicians, and of the more recent authors of the present century, in other parts of this work, we shall content ourselves at present with the mere mention of their names.

In concluding our short history, we would refer such of our readers as are interested in studying ancient authors to Lucian's famous comic poems, the Tragopodagra and Ocypus; in which many points connected with the nature and treatment of gout are very truthfully, though ludicrously, portrayed, showing that the knowledge of this disease was by no means inconsiderable in those remote times.

We have already alluded to the division of gout by the ancients, according to the seat of the affection, into

Podagra, Chiragra, Gonagra, &c.; the more modern classifications which are worthy of notice are those of Cullen, Mason Good, Scudamore, and Hamilton. Cullen divided the disease into four varieties, regular, atonic, retrocedent, and misplaced gout; Mason Good into three kinds, regular, disguised or lurking, and complicated gout; Scudamore into acute, chronic, and retrocedent gout; and Hamilton proposed a still more simple separation, namely, into acute and chronic gout. As forced attempts at subdivision and refinement tend rather to complicate than render clear the various phases which a disease is capable of exhibiting, I shall endeavour in the present treatise to simplify as much as possible, and shall discuss the phenomena of gout under the heads of, 1st. *Regular Gout*, which may be acute or chronic, and is evidenced by the presence of a peculiar inflammation of the structures in and around the joints; and, 2nd, *Irregular Gout*, manifested either in severe functional disturbance of any organ, or in the development of inflammation in tissues other than those connected with the joints. The last variety includes the various forms classed by different writers under the heads of atonic, misplaced, retrocedent, lurking, and abarticular gout; but it must not be forgotten that many diseases which have by some authors been grouped under these various denominations have no claim to be considered truly gouty.

Some objection may perhaps be made to the use of the terms regular and irregular gout, and it may be asserted, perhaps with truth, that its so-called irregular manifestations are in fact quite as regular as the articular affection; however, the terms are convenient, and the meaning to be attached to them has been sufficiently explained.

CHAPTER II.

ACUTE GOUT:—DESCRIPTION OF AN EARLY ATTACK—PREMONITORY SYMPTOMS—SEAT AND CHARACTER OF GOUTY INFLAMMATION—PARTS FIRST AFFECTED—PAIN—ŒDEMA—DESQUAMATION—NOT FOLLOWED BY SUPPURATION—APPARENT EXCEPTIONS—FEBRILE DISTURBANCE—TEMPERATURE—PROGRESS OF GOUT—ILLUSTRATIVE CASES—ACUTE GENERAL GOUT—SEQUELÆ OF ACUTE GOUT—IS GOUT A SALUTARY DISEASE?—GOUT SIMULATING RHEUMATISM—SYDENHAM'S DESCRIPTION OF ACUTE GOUT.

THE phenomena attending an acute fit of gout have been frequently and ably described, especially by Sydenham, who had, in this respect, the questionable advantage of being able to record what he himself both felt and observed. Although, unlike Sydenham, unable from personal experience to describe the sensations of gout, still I will endeavour to depict the phenomena which have usually come under my own observation; the description referring more especially to the first, or, at any rate, an early attack of the disease.

An individual, apparently in good health, perhaps even flattering himself that he feels unusually well, retires to bed; after a few hours' sleep (generally from one to four in the morning), he suddenly awakes, with a pain, more or less intense, in the ball of one great toe, frequently accompanied with a slight shivering; the pain in the foot gradually increases, and is attended with a sensation of burning and throbbing, together with great tension and stiffness; heat of skin and other symptoms of febrile disturbance usually follow the shivering, accompanied with a considerable degree of restlessness. After a few hours these symptoms abate, a gentle perspiration ensues, and the patient is enabled to enjoy some sleep. In the morning the toe is observed to be swollen, the skin of deep red colour, tense and shining, and the whole joint exquisitely tender; the veins proceeding from the inflamed part are distended with blood, producing slight lividity, and an appearance is exhibited closely resembling the drawing in Plate I. fig. 3, with the exception of the white spots, which, in the delineated toe, are due to deposits of urate of soda from oft-repeated fits of gout.

During the height of the attack, the pain is usually so intense that the patient can neither bear the weight of the clothes, nor even any shaking of the bed from footsteps in the room. Although in most cases the pain abates after a few hours, yet if the attack is very severe, it may last throughout the day; but towards the evening it again increases, and the second night is generally passed in a state of renewed restlessness and suffering. The symptoms on the third day may be but a repetition of those of the second, and thus the patient may continue to suffer for days, or even for weeks; the length of the attack being influenced by many circumstances, and especially by the character of the treatment which is adopted. If fever runs high, the appetite is usually bad; there is also some thirst, and often constipation; the urine is high-coloured and scanty, and gives rise to a red sediment on cooling, and the patient is apt to be troubled with severe cramp in the legs.

When the attack, or more properly speaking, series of attacks, is about to terminate, the inflamed joint becomes less tense and less swollen, and pitting is readily produced on pressure, the redness and enlargement of the blood-vessels also disappear, and after a few days, itching of the skin and desquamation of the cuticle ensue.

In the first fit of gout, and frequently for many attacks, the ball of one great toe may be the only joint implicated, but occasionally the inflammation in it suddenly subsides, and the corresponding toe of the other foot is attacked; not unfrequently the inflammation travels so as to implicate the inner side of the foot. The above description refers more particularly to the first few attacks of gout in robust and otherwise healthy subjects, and may be taken as typical of *acute sthenic* gout; but now and then, especially among women, an acute fit may be wanting in many of these symptoms; there may indeed be pain and tenderness in the toe, and some amount of swelling, but accompanied with little heat or redness, and all febrile disturbance may be absent; still œdema is generally observed, and itching and desquamation follow; this latter form, which may be considered as representing *acute asthenic* gout, is doubtless of the same nature in its essence or pathology as sthenic gout, the difference depending on the peculiarity of the patient rather than of the disease.

It must not for a moment be supposed that the asthenic form is less injurious in its results than genuine sthenic gout; far otherwise, for it is much more likely to lead to permanent mischief.

Prior to a first attack of gout, there is generally an absence of any prominent premonitory symptoms, although disturbance of the function of some organs would probably be observed if the patient were narrowly watched for a few days preceding the fit; but afterwards there are usually uncomfortable sensations experienced for days or weeks before a fit, which are generally referable to the digestive organs, such as heartburn, acidity, flatulence, drowsiness after food, hiccup, confined bowels, loss of appetite, lowness of spirits, and a feeling of lassitude. The urine before an attack is usually scanty and high-coloured, but sometimes, on the other hand, very copious and pale. When individuals are liable to weakness or disturbance of any particular organ, symptoms referable to it are apt to manifest themselves; for example, some experience palpitation of the heart or intermission of the pulse; some are troubled with hæmorrhoids or irritability of the bladder; others are annoyed with excessive cramps and itching of the skin; the temper is often much ruffled, and the patient becomes peevish and irritable. If he chance to be subject to bronchitis or other chronic affection of the chest, an increase of cough and dyspnœa may precede a fit, and be greatly relieved on the occurrence of the gouty paroxysm.

Having given a general sketch of an ordinary fit of gout, we will now enter a little more fully into the consideration of the various characteristic phenomena which it exhibits.

I.—LOCAL PHENOMENA.

The first point to be noticed is the *seat of the inflammation*. We have said that it is commonly the ball or metatarso-phalangeal joint of the great toe; and unless there are circumstances in the case which have, as it were, thrown the disease upon some other joint, and some such we shall have more particularly to notice hereafter, true gout, at its first invasion, seldom attacks any other part, and even if another joint be first affected, the ball of one of the great toes is generally implicated. Sir C. Scudamore drew up a list of 516 cases of gout, for the purpose of determining this point; and from this table we find that one or both of the great toes alone were affected in 341 instances, and the great toe with some other part in 373 cases. The details of the table are seen below.

In the great toe of one foot only	314
In the great toe of both feet	27
In the knee and great toe	1
In the little toe and one adjoining	1
In the great toe and instep	4
In the great toe and instep of both feet	2
In the great toe of one foot and instep of the other	1
In the great toe, instep, and ankle of one foot	1
In each great toe and each hand	1
In the external side of the foot and the great toe	1
In the external side of one foot and the great toe of the other	1
In the heel and the great toe	2
In the ankle of one foot and the great toe of the other	5
In the ankle and great toe of the same foot	11
In the tendo Achillis and the great toe of the same limb	1
In the outer side of one foot	10
In the outer side of both feet	1
In the sole of the foot	4
In the heel of one foot	6
In the heel of both feet	2
In the heel and instep of the same foot	2
In the heel of both feet, in both hands and both elbows	1
In the ham	1
In the knee	11
In both knees	1
In the instep of one foot	25
In the instep of both feet	6
In one instep first, afterwards both knees, both wrists, both elbows, and both shoulders	1
In one ankle	36
In both ankles	11
In the ankle and instep of one foot	4
In the tendo Achillis	4
In the tendo Achillis and ankle	1
Calf of the leg	1
In the thumb, knee, ankle and great toe on one side, and the great toe of the other foot	1
In the right knee and left hand at the same time	1
In the back of one hand	4
In the wrist	4
Thumb and hand	1
In the thumb	1
In two middle fingers	1
In one middle finger	1
In the fourth finger	1

My own experience fully confirms the results in the above table, especially as to the frequency of the great toe being selected; and I am convinced that in many cases of joint affection, where difficulty would otherwise exist as to the precise nature of the disease, considerable light may be thrown upon the subject by directing attention to this fact; it appears remarkable that this particular joint should be selected by the disease upon which to vent its first fury; however, so it is; and when we shall again have occasion to refer to this point in discussing the nature of gout, we may possibly be able to give something like a rational explanation of the phenomenon. From an investigation of the history of a considerable number of cases of true gout, I find that in not more than five per cent. were other joints implicated, to the exclusion of the great toe; and all authors, both in this country and abroad, seem to be fully agreed upon the matter. In point of frequency in being attacked, the ankle seems to be second to the ball of the great toe; afterwards the instep, next the outer side of the foot, then the knee; whereas, the upper extremities are seldom implicated in early gout.*

The frequency of the toe affection cannot be looked upon as a mere fortuitous circumstance, but must be intimately connected with the pathology of the disease; and when deviations are found, they seem to depend on accidental circumstances, more especially the previous occurrence of some severe injury. I possess notes of several cases more or less resembling the following:—A gentleman, with a strongly marked hereditary predisposition to gout, hurt his knee by a fall when hunting; the pain was not very severe at first, but in the course of a few hours became intense, much more so than could be accounted for by the nature of the injury; it soon, however, became evident that the joint was affected with acute gout, which was speedily relieved on the ball of the great toe of the same side becoming inflamed. After two years, this patient had a second attack of gout, which was then confined to the ball of the great toe. Scudamore relates the following case:—A gentleman, when a youth, received some small shots from a gun in one knee, which were removed: in after life he had gout, which not only first attacked the injured knee, but ever afterwards with more severity than any other joint. Many other examples might be quoted, illustrative of the influence of local mischief in causing gout to appear in the injured parts; but as we shall again refer to this subject when speaking of the exciting causes of the disease, we will content ourselves at present with the instances already given.

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* Dr. Braun, of Wiesbaden, found that out of forty cases of gout, the attack occurred in the great toe in thirty-six cases, in the heel in two, in the knee in one, and in the hip also in one case. He also found the left side affected in twenty-four cases, the right in sixteen only.

The peculiar *character of the inflammation* next deserves our attention, and first as to the *pain;* this is said to differ from that experienced in other forms of inflammation; a man once broke his leg, and soon afterwards had a fit of gout in the great toe of the opposite foot; it was his opinion that the pain of the gouty foot was different in character from that of the injured limb and more severe. The pain of gout differs also in other respects from that of rheumatism; in gout it often precedes the other signs of inflammation, is more localised, and generally at first confined to a spot on the side of the joint, whereas in acute rheumatism the pain extends throughout the whole articulation. Sometimes it is said to resemble the gnawing of a dog, or the tearing of the joint asunder. Sir Thomas Watson, in his admirable Lectures on the Principles and Practice of Physic, gives the description by a humorous Frenchman of the distinction between the pain in gout and in rheumatism: "Place," says he, "your joint in a vice, and screw the vice up until you can endure it no longer, that may represent rheumatism; then give the instrument another twist, and you will obtain a notion of gout." Now and then I have met with cases in which the pain was not very severe, although the inflammation appeared to run high, and some of these were first attacks of gout; such instances, however, form the exception rather than the rule.

The production of *œdema* and subsequent *desquamation of the cuticle*, is a peculiarity of gouty inflammation when it attacks superficial structures, and it is one deserving attention; for although œdema cannot by any means be considered as pathognomonic, still it is sometimes of considerable value in diagnosis. During the early stage of an attack, when the inflammation is violent and the skin distended and shining, the œdema cannot be readily observed, on account of the tension; when, however, the inflammation begins to subside, pitting can be easily produced and the presence of fluid made evident. As a rule, true rheumatic inflammation is not accompanied by œdema: but it now and then occurs even in undoubted cases of acute rheumatism; it is then, however, more general in character, affecting the whole limb, and not so strictly confined to the inflamed part, as in cases of uncomplicated gout. The desquamation of the cuticle is a subsequent symptom, taking place after the complete subsidence of the gouty paroxysm; it is most usually observed about the feet and hands, rarely in the knees; it seems, as far as my own experience goes, to bear some relation to the amount of the previous œdema and distension of the skin; occasionally even the nails have been shed after a severe attack of gout. Prior to and accompanying the desquamation there is often considerable itching; a symptom which follows other slight injuries to the skin, as, for example, the application of a blister. Scudamore observed that in 234 cases, seventy-eight patients never experienced desquamation, and in my own notes I find several in which this symptom is not mentioned; but it must be remembered that it is one readily overlooked, unless specially sought for. With regard to the cause of œdema occurring so frequently in gouty, compared with other forms of inflammation, nothing very satisfactory has yet been made out: may it not depend on the impurities in the blood? May not the presence of urate of soda and a small amount of urea in that fluid, be at least one cause? As we proceed we shall discover that the blood in gout differs much from that in rheumatism, especially as regards the presence of these excrementitial matters. It is worthy of remark in connection with this subject, that in rheumatism connected with urethral discharge, as likewise in pyæmia, œdema can generally be detected in the inflamed parts.

Upon the *temperature of the parts affected* with gouty inflammation, there is nothing of importance to remark; patients often express themselves as suffering from intense heat of the joints, but the thermometer shows no greater increase of temperature than is ordinarily found in many other forms of inflammatory disease; the extraordinary sensation of heat, therefore, which is sometimes felt by the gouty, must arise, not simply from increase of temperature, but from a peculiar exaltation and perversion of the nervous function.

Gouty inflammation differs from common phlegmonous inflammation in some other important points, and more especially in *not being followed by suppuration.* If a medical man, by chance entirely ignorant of the nature of gout, were to see a toe affected with this disease in its full intensity, swollen, hot, red, and tender, he would probably think that the affection must of necessity terminate in suppuration; yet I believe this never happens as the result of simple gouty inflammation. I have, it is true, seen cases which at first appeared to favour the idea that suppuration sometimes occurs; but, on further investigation, in each instance the formation of matter could be otherwise satisfactorily accounted for.

The following case illustrates these remarks:—A man, C. F., was attacked with a violent fit of gout, affecting many joints, and, among others, the first phalangeal joint of the right index finger; the swelling rapidly increased, was accompanied with much pain and redness, and in the course of four days gave distinct evidence of the presence of fluid; a small puncture was made with the point of a lancet, and a drachm or more of a milky-looking liquid escaped, containing pus globules, mixed with numerous crystals of urate of soda, the latter aggregated in small masses. It was afterwards found that deposits had previously existed in the part, and the suppuration was doubtless owing to the inflammation occurring around this foreign matter. Scudamore states in his work, that he only found suppuration in eight cases, and noticed that in each instance the result was curiously modified by an attendant secretion of urate of soda: I believe that in all, had they been specially examined, some deposit might have been detected, the result of former attacks. I have never witnessed, and am not aware of there being an example on record of a *first fit* of gout, however intense, being accompanied with the production of pus.

II.—GENERAL PHENOMENA.

I believe it may be considered as the rule, that in acute gouty attacks the amount of *febrile disturbance*, as indicated by the rapidity and force of the pulse, the increased heat of body, thirst and loss of appetite, bears a close relation to the extent and severity of the local inflammation; that the fever is, in fact, chiefly symptomatic, and differs greatly from that which occurs in acute rheumatism, when the highest febrile disturbance may exist without any proportionate inflammation of the joints.

The following case illustrates the close relation existing between the febrile disturbance and the amount of local disease.

January, 1855.—H. C., ætat. 32, had his first attack of gout, when 28 years of age, confined to the ball of the left great toe, which was hot, swollen, and painful; it afterwards pitted freely on pressure, and gave rise to desquamation of the cuticle. For two years after the first fit he had a return each year about Christmas; but within the next two years, an additional one in the summer. The fits gradually increased in severity, and the number of joints implicated became more numerous at each visitation. When first seen the left great toe, instep, and ankle, were swollen, hot, and painful; the corresponding parts on the right side were inflamed, although in a less degree; the wrists, hands, and elbows were also much affected, and the knees slightly so.

This case affords an example of acute gout affecting *many* joints, and the febrile disturbance was found to be of corresponding intensity: the pulse for example was hard and full, 108; the skin hot and dry; the tongue furred, with much thirst. After a few days' treatment, the joints were relieved, and the pulse became soft, and only 74 in the minute. The thermometer was not then employed in the investigation of disease.

The next case presents an example of the acute affection in which *one* joint only was implicated.

November, 1854.—J. P., ætat. 44, had his first attack of gout at the age of 40; the second, two years afterwards, the present being his third fit. Is now complaining of great pain in the ball of one great toe, which is much swollen, hot, red, and pitting a little on pressure.

Tongue furred, and slight thirst. Pulse 78, and no other symptom of fever.

The *temperature* of the body, taken under the tongue or in the axilla in cases of acute gout, ranges from 99° F. to 104° F. I have only seen it 104° in one case; more commonly it ranges from 100° to 102° in the acute cases, where many joints are implicated; and from 99° to 100° where one or two joints only are attacked.

The *pulse* usually follows the temperature, except in special cases, in which the heart is either functionally or organically affected.

The *skin* is usually hot and dry at first, but becomes moist, especially after the inflammation is fully established; the excessive and peculiar sweating so constantly seen in acute rheumatism, is not met with in acute gout.

The *digestive organs* are frequently much disturbed, but now and then cases are met with in which they appear to remain in a healthy state. The tongue is furred, the appetite impaired, and more or less thirst is felt; the bowels are often confined, the actions generally unhealthy, and in many cases there is evidence of congestion of the portal system, accompanied with hepatic enlargement and fullness of the hypochondrium; this condition may be only temporary if simply dependent on the attack, but in many cases it is permanent, the result of disease of the liver, which is apt to be induced by the same causes which lead to the production of gout.

Having discussed the most important phenomena usually attendant upon a first or early attack of gout, we will next endeavour to trace the further progress of the disease. Occasionally but a single attack of gout is experienced, but this rarely happens if life is prolonged; more commonly the disease returns after an interval more or less prolonged, depending on constitutional tendency, mode of living, and the amount of predisposing and exciting causes. Several years may elapse between the first and second fit; frequently two years, more often one, but now and then there are only a few months' interval between the attacks; as the disease becomes grafted into the constitution, the attacks are frequent, and at the same time more general in their character. When patients live within moderate bounds, and when the hereditary predisposition to gout is not very great, the disease may confine itself to the ball of one or other great toe, even for a period of many years, but the tendency of the disorder is to travel upwards, and next to the foot, the ankles, then the knees, and afterwards the hands and elbows are attacked; so frequently is this order of succession met with in true gout, that the history of a case will often serve as a trustworthy guide in arriving at a correct diagnosis.

My note-books afford numerous illustrations of what I have now stated; it will be sufficient, however, to give shortly the details of a few cases only.

Case illustrating the regularity with which for many years gout affects some patients.

1857.—C. M., ætat. 55 years, no gout known on either father's or mother's side, but he has a brother slightly affected with it. Fifteen years ago he remembers going to bed feeling quite well; but about four o'clock in the morning he woke up with pain and stiffness of the right great toe, which soon became hot and swollen. The fit lasted about three weeks, and no other joint was implicated.

The second fit came on at the end of a twelvemonth, affecting the same joint; commencing at the same time in the morning, and lasting altogether about a fortnight. For the next six years, the attacks occurred annually, and were all confined to the metatarso-phalangeal joint of one or other great toe.

Six years ago, the upper extremities first became implicated, the disease attacking the wrists, knuckles, and phalangeal joints of the fingers; the fits having returned uniformly at the same season of the year, until the last twelve months, but since that time they have been more frequent and irregular in period.

It is astonishing to find how uniformly in some cases, the returns of gout occur, for not unfrequently patients are able to calculate the time of an attack, within a few days.

Case in which for many years the intervals between the attacks were long, and, at the same time, very regular.

1861.—A gentleman aged 49 years; he cannot trace gout to any of his ancestors, but has always lived well and partaken freely of malt liquors and wine; with the exception of gout he has always enjoyed good health. The first attack occurred ten years since, and was confined to the ball of the right great toe; two years afterwards, the same joint was similarly affected; two years again elapsed between the second and third fits, and a similar interval between the third and fourth; the disease being as yet confined to the one toe. In the year 1858, the left great toe and instep were affected, and in 1859, the right toe was again selected; in 1860, both great toes were implicated consecutively. After this, gout became more frequent, and within the last six months he has suffered from three attacks, sometimes in one foot, sometimes in both, but the knees and upper extremities have remained free. The urine is usually clear, contains no albumen, and gives rise to a very moderate deposit of uric acid on the addition of a foreign acid.

I may add, that under treatment this patient soon became free from gout, and has remained so for a period of nine months, having, when last seen, passed through a severe ordeal during the autumn and spring. The long intervals which so repeatedly occurred in the above case, may be explained by the absence of any hereditary predisposition, the possession of a good constitution, and the age of the patient; the check now given to the progress of the disease is due not alone to medicinal treatment, but to abstinence from the chief predisposing and exciting causes.

The next two cases illustrate, among other points, that sometimes very long intervals occur between attacks of gout.

Oct. 1861.—A gentleman, ætat. 50, inheriting gout from his father, had his first attack when somewhat young, in one great toe; after many years the second fit occurred in the same joint; then, after an interval of four years a third, and a fourth about three years afterwards, and so on for six or seven attacks; up to this time the disease had been mild, of short duration, and had confined itself to the feet with one exception, when the knuckle of an index finger was implicated. In July of this year a more severe attack came on, first in the left heel, then in the left great toe; afterwards in the right great toe, and during August the same succession was repeated; in September, the heel was for the third time affected and one toe; he has now scarcely recovered. No dyspeptic symptoms have been noticed, either during the attacks or in the intervals, but the patient is subject to cold extremities and shows other evidence of a feeble circulation: he is very careful as to diet, takes a little claret, and at times cider, but no malt liquors. It would appear that hereditary tendency is the chief cause of gout in this instance, and the lengthened intervals may be attributed to great care in the manner of living.

January, 1876.—The second case illustrating the same fact was that of a General, whose father died very young, but whose paternal and maternal grandfathers suffered from gout. He himself had gout when only 18 years of age, and continued to have attacks chiefly confined to the great toes, until he was about 30. After this time till last spring, he being then 65, he remained completely free from gout, but then had a well-developed attack in one great toe. For some years, during the period of freedom from the disease, he had served abroad in Bulgaria and India, and had suffered in the former place from the peculiar fever of the country.

Case of gout of an opposite character, in which the attacks, from the first, came on with great rapidity.

1862.—A gentleman, aged 40 years, having no known hereditary predisposition to gout, and never having indulged to any extent in alcoholic beverages, was first attacked in April, 1861, in the ball of the right great toe, which was swollen and painful; the attack lasted about a fortnight, during which time the left toe was likewise somewhat implicated. Three months subsequent to this the second fit occurred; four months afterwards, the third, and the fourth after an interval of two months only; in all of these attacks, the disease was confined to one or other of the great toes. It is difficult to account for this rapid succession of gouty attacks, as the kidneys appear to be free from disease, and there are no marked dyspeptic symptoms.

Although it generally happens that the ball of the great toe is the joint first affected in gout, or at least becomes implicated during the progress of the fit, this is not invariably so, and we must by no means conclude that a disease is not gouty, simply from the absence of the toe affection; for now and then striking examples present themselves of genuine gout, the great toe during the whole time remaining quite free: these cases occasionally offer considerable difficulties in diagnosis, and their careful study is of much importance.

The following are instances of this exemption:—*

Case of gout of 15 years' standing, in which the great toe joint has never been attacked.

1864.—J. L., a gentleman, æt. 47, with no known hereditary tendency to gout. He first experienced the disease in 1849, on the outer side of one foot, and it was confined to that part; the attacks were rather numerous, at first even two or three in the year (it may be stated that he was in the habit of partaking freely of sherry). Of late the attacks have been still more numerous, as many as three during the last three months; but they have never been in the *great toes*, and never above the knees, but chiefly in the arch of foot and heel. There are numerous white deposits of urate of soda in the ears, which had been noticed for ten or twelve years, but without any apparent inflammation of those parts.

Cases of gout somewhat similar to the last.

April, 1864.—R. W., a gentleman 37 years of age, whose paternal uncle and grandfather had suffered from gout. Had lived in India and China seventeen years. In 1856 had an injury to one knee, which caused much inflammation, probably of a gouty character; and from this time the knee was apt to become affected from slight causes: in 1866 the left elbow was attacked, and the loins. He had been previously much exposed to weather in China. In 1862 a similar attack; after that, in 1863, the right shoulder, then the left elbow and left ring finger, and within the last two months the right elbow and right knee. Never had any great toe affection. Deposits of urate of soda in both ears, and the middle joint of the finger above mentioned was considerably thickened. No albumen in urine.

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* In a note to the French edition of this work, Dr. Charcot has related two cases, one in the practice of himself and Dr. Ollivier, the other in that of Dr. E. Desgrandes. Both patients exhibited all the symptoms of true gout, with the exception that the great toe joints were never affected. The post-mortem examination also revealed the presence of deposits of urate of soda in very many articulations, but not in those of the great toes.

October, 1858.—H. P., a male, aged 38, came under my care in the hospital, on account of severe suffering in both ankles. It appeared from the history of the case, that his father had been greatly afflicted with some joint disease, to such an extent as to cause him to be bedridden for sixteen years; it was considered to be rheumatism. The patient, when fifteen years of age, had an attack of what appeared to be rheumatic fever, affecting the wrist and other joints of the upper extremities; seven years afterwards, he had a second of similar character, but implicating the lower extremities also. From this time to his admission, he had suffered at four or five different periods, the disease generally assuming a chronic form, and rendering him helpless for many months. He cannot remember that the ball of the great toe was ever implicated. By occupation he is a cellarman, and is exposed to cold and damp; he takes on an average each day, at least four pints of pale ale or other malt liquor, and sometimes a considerable amount of wine. On admission, three weeks after the commencement of the attack, both ankles were painful and tender, but not swollen or red; he was unable to flex them, and the least attempt to do so was accompanied with much pain; pulse 72; tongue slightly furred and no thirst; appetite moderate; bowels regular; no perspirations; the pain in the joints somewhat increased at night. The urine scanty, sp. gr. 1030, giving rise to some crystalline deposit of uric acid on standing; no albumen present.

As there was some doubt as to the real nature of the disease, about two ounces of blood were taken from the arm, and the serum exhibited the presence of a moderate amount of uric acid when treated by the thread experiment detailed in a subsequent chapter.

The patient was put upon middle diet, and a few grains of iodide of potassium ordered; but after four days his condition remained the same, with the exception of a slight alleviation of the pain in the joints, probably due to the perfect rest and regulated temperature enjoined. It being found upon inquiry, that he had usually taken pale ale in preference to porter, considering it better adapted to his disease, and as he thought he felt more pain in his joints after taking stout, and, moreover, as the examination of the blood had shown the existence of an abnormal quantity of uric acid, I deemed it advisable, in order to arrive at a correct diagnosis, to see the influence of a change of diet upon the patient. For this purpose, as his appetite was good, the extra full diet of the hospital was allowed, with the addition of two pints of porter, medicine being omitted. For the next four days all went on satisfactorily, but on the fifth he complained of severe pain, first in the right and then in the left ankle, which soon became swollen and red, and two days afterwards pitted freely on pressure, and gave rise to desquamation of the cuticle; the tongue was furred, pulse above 100, but no marked thirst. The porter and meat were then discontinued, and a draught containing half a drachm of colchicum wine in camphor mixture, administered three times a day. Within forty-eight hours the ankles were greatly relieved, and in a few days were quite free from swelling or redness, and altogether in a much healthier state than since the commencement of the attack; the colchicum did not produce either nausea or looseness of the bowels.

Why the great toes escaped in this case it is difficult to determine. May not the acute rheumatism in early life have left a certain amount of alteration in the larger joints, predisposing them to become affected by the gouty poison? We know that after accidents the weakened parts are more susceptible of its influence.

In this case no deposits of gouty matter could be discovered, but the first phalangeal joint of the right little finger was flexed and almost anchylosed, whether or not by the deposition of urate of soda in and around the joint, it is impossible to decide; however, the character of the inflammation, the condition of the blood, the influence of diet, and the striking effect of colchicum upon the disease, leave no doubt that the case was one of true gout; and there can be no reason why a patient, who was in early life subject to rheumatic fever, should not acquire in after years the gouty diathesis.

We have said that gout in its early attacks ordinarily selects one, or at most only a few joints, and that the smaller articulations are more particularly fixed upon; exceptions to this law are now and then met with, in which the larger joints are implicated, and the number of those affected is increased, and there is often much difficulty, at least at first, in making a correct diagnosis, as they closely resemble cases of acute rheumatism; a very remarkable instance of this form of acute general gout came under my care a few years since, in which, if any difficulty existed at first, the subsequent phenomena left no doubt of its true nature.

December, 1853.—C. F., a man aged 35, was brought to the hospital under the following circumstances:—On the previous day he had been struck in the infra-axillary region by the shaft of a cart, which had knocked him down and fractured one or more of the left ribs. He was at first admitted into the surgical ward, and as there was evidence of some small amount of traumatic pleurisy, he was ordered to be cupped over the chest, and to take three-grain doses of blue pill and half a grain of opium every three hours. In the evening he felt pain in the left elbow-joint, and during the night the fingers of the left hand became red and swollen, in addition to which the soles of the feet and right knee were involved. As the case assumed a medical rather than a surgical character, the patient was next day (two days after the injury) transferred to one of my wards, when his condition was as follows:—

Countenance pale and sallow; pulse 108, rather small, but hard; skin hot and somewhat moist, tongue furred, gums red and swollen, and breath mercurial; much thirst and loss of appetite. The joints affected were the left wrist, hand, and elbow, which were hot, red, and swollen, as were likewise the right knee and ankle, and little toe of the left foot. A friction sound was heard from the middle of the left back of the chest extending round to the axilla.

The next day most of the inflamed joints pitted distinctly on pressure, and the middle joint of the right index finger was much swollen, the circumference being at least twice that of any other; the skin also was very hot and red, and the whole finger exquisitely tender and painful. On the following day the condition of the patient was much the same. Up to this time the patient had been looked upon as suffering from acute rheumatism, and the treatment had been such as is usually adopted for this disease, but I now suspected that my first diagnosis was faulty, and that the case was one of genuine acute gout; my reasons were as follows:—*First*, the blood drawn by cupping from the chest was found on examination to be rich in uric acid; *secondly*, the character of the inflammation was such as usually occurs in true gout and rarely in rheumatism, the more important points being the shining appearance of the inflamed skin and the subsequent pitting on pressure; *thirdly*, the fact of the patient being so readily affected by mercurials—an occurrence by no means uncommon in gout, but rare in rheumatism; and *lastly*, I was assured that the patient was labouring under acute gout, from the future progress of the case. In the course of a few days the swelling of the right index finger increased to such an extent as to present the appearance of intense distention, and to give rise to fluctuation; at the same time the other joints were much relieved, and the febrile disturbance had abated under the influence of the colchicum administered. Shortly afterwards, on puncturing the distended skin of the finger, a milky fluid exuded, which, under the microscope, was found to owe its opacity to innumerable crystals of urate of soda, in the form of very fine needles (Plate V., fig. 3). On making further inquiries into the history of the case, I ascertained that this was not the first attack of joint affection he had experienced, for about fifteen months previously he had laboured under some inflammation of the foot, with the characters of ordinary gout. In the course of a few weeks the nature of the case was still more clearly established, from the fact that a small deposit of urate of soda occurred in the helix of one ear; and since that period, now about seven years, chalk stones have formed in different parts, and gouty symptoms have from time to time exhibited themselves in their ordinary type, in the great toe and elsewhere. The patient was a painter by trade, had drunk about a quart of porter each day, and inherited gout from the mother's side: two of his brothers have since been my patients, suffering from the same disease.

Many cases of acute general gout, more or less allied to the one just quoted, have been described and regarded as attacks of acute rheumatism. I am inclined to think the following, which is classed as one of acute rheumatism developed during an attack of acute gout, is an example of this fact; it is related by Mr. Spencer Wells in his interesting work on this subject:—"A gentleman about forty years of age, descended from gouty parents, and accustomed to indulge rather freely in the pleasures of the table, about five years ago had a slight attack of gout under the ball of the right great toe. This soon went off, but at intervals of three or four months similar attacks had recurred, their severity and frequency both being on the increase. One evening he felt that an attack was threatening, but he attended late in the House of Commons, and, as the pain was increasing, he thought a day's exercise would probably ward off the attack, as he had found it do so before. Accordingly, on leaving the House, he posted all night between seventy and eighty miles to have a day with his hounds. He arrived but just in time to equip for the field, and had one or two short runs and a very long one, in the midst of the rain on a cold day. He had to ride fifteen miles on a tired horse, on returning, and when he reached home had to be lifted from the saddle and carried to bed. He took hot brandy and water, but a severe rigor came on, and a general attack of acute rheumatism set in on the following day. It was so severe that the gouty inflammation of the foot was disregarded, attention being given to the state of the heart and general condition. In about a fortnight he was convalescent, so far as the rheumatism was concerned, but the gouty action continued in the foot, and did not disappear until a few doses of colchicum had been given." Another case from the same author, and considered to be likewise one of acute rheumatism in a person affected with chronic gout, is as follows:—"A gentleman affected with chronic gout, having considerable deposits of lithates in the fingers and around the ankles, and being subject to copious urinary deposits of varying composition, passed some time in Malta to obtain the advantages expected from living in a warm climate. After a very hot day he remained in a boat in the harbour, fishing, for some hours, on a moonlight evening. He had been perspiring freely in the afternoon, and was lightly dressed. He felt rather chilly before he went home, had a severe shivering fit in the night, and was confined to his bed for twelve days with a smart attack of acute rheumatism affecting the knees, shoulders, and loins, but not any of the joints which had previously been affected by gout."

That many cases of acute gout have been mistaken for acute rheumatism, I do not doubt, and, on the other hand, that some few cases of acute rheumatism have been regarded as of a gouty nature, I am no less certain; I may refer to the oft-quoted case related by Dr. Haygarth, in which gout is supposed to have been transferred from the extremities to the heart, as an example of the latter error.

The early attacks of gout are not usually followed by any very appreciable evil consequences, and as one of the effects of a severe paroxysm is to rid the blood of the impurities which had probably been lurking there for some length of time, it is not uncommon to hear patients express themselves as even benefited by the occurrence of the gouty fit. Gout, on this account, was formerly looked upon as a salutary disease, and one capable of removing all others; but the error of the opinion can be now readily demonstrated, and we shall be able to show that every attack is attended with permanent local mischief, which, though slight at first, may, by frequent repetition, be sufficient to induce serious inconvenience. This opinion as to the advantages of gout is now fast wearing out, even amongst the public; intelligent physicians have long exposed its fallacy, and have combated it, as shown by the following extracts from Heberden's Commentaries, and Coste's Traité pratique de la Goutte. Heberden's remarks are to the effect, that although some patients congratulate themselves upon the completion of their wishes, and during the honeymoon of the first fit of gout dream of nothing but perfect health and happiness, and persuade themselves that they are much the better for it, still this is the exception rather than the rule; for he states that he had often seen gout arising during the progress of other diseases without giving relief, and that the number of cases in which it has produced increased mischief was double that in which it had befriended the constitution. It is true that other disorders will at times be suspended after an attack of gout as upon the accession of other acute diseases, but at other times no such result follows. Heberden states that if gout return but seldom it may do but little harm; but so if epilepsy occur but once a year, the patient may live to a good old age.

M. Coste writes to this effect:—" A popular error, which I wish to expose in a few words, is this prejudice, which has already lasted more than two thousand years, and which has reached even the thrones of princes, where the disease commonly shows itself, viz., that gout prolongs life (*que la goutte prolonge la vie*). This error," says he, "has taken the surest method of introducing itself, by making flattering promises, by persuading its victims that there is a singular advantage in having gout, and that the malady drives away all other evils, and that it ensures long life to those whom it attacks."

It occasionally happens that a patient fails to get rid of the ill effects of an attack of acute gout, as the affected parts may remain very tender for a long period of time, although no appreciable structural mischief has taken place; and sometimes there is a considerable tendency to œdematous swelling, more especially if the fit has been of long duration. A case occurred in my practice a few years since, bearing forcibly upon this point. A gentleman enjoying good health, with the exception of occasional attacks of gout, consulted me on account of swelling of the feet and ankles, remnants of the last fit of the disease. Up to the period of the last attack he had been accustomed to apply to his usual medical adviser, and was generally restored to health in about ten days or a fortnight, but in the last attack he had been persuaded to put himself under the treatment of a homœopathic practitioner, and had complied strictly with his injunctions regarding both medicine and regimen. At the end of the fortnight, instead of finding himself well, as had formerly been the case, the disease was still present in its full intensity; he was, however, comforted by the assurance that, although the cure might be slow, yet it would be the more complete, and thus he continued to bear his sufferings for seven weeks, until the acuteness of the disease had fairly worn itself out. It was then found that it had left considerable tenderness of the structures previously inflamed, and likewise well-marked œdema, symptoms for which he was desirous of obtaining my advice. On examining the urine, it was found quite free from albumen, and the only cause which could be assigned for the swelling was the great weakness of the blood vessels, the result of prolonged inflammation. Treatment adapted to remove any remains of gout, together with the use of the elastic stocking, proved sufficient for the cure. This case is a good illustration of the fact that, even with great care as regards diet and regimen, gout may prove extremely tedious, and we shall be able to show that such duration is attended with the production of serious mischief, and should be curtailed when possible by the application of appropriate remedial measures; those who have had many opportunities of witnessing the progress of gout will not, I believe, be inclined to agree with Cullen's aphorism: "The common practice of committing the person to patience and flannel alone is established on the best foundation."

Although the earlier attacks of gout are usually attended by no great amount of subsequent inconvenience, this is not invariably the case, as I have known the formation of chalk-stones occur very shortly after the commencement of the disease, and, within a period of two or three years, increase to such an extent as entirely to cripple the patient. Such an occurrence, however, forms the exception, and not the rule, in the progress of gout, for, on the other hand, many cases have come before me in practice, in which the patients have suffered, more or less, for forty or fifty years, without perceptible inconvenience.

Acute gout, even in its first attack, when accompanied by but slight local inflammation, will occasionally cause permanent stiffness, or complete anchylosis, and this may occur with very little accompanying enlargement, though attended with serious changes in the deep structures of the joint.

A case under my charge, in 1858, well exemplifies this fact:—J. P., a male patient, fifty-six years of age, by occupation a fishmonger, having no known hereditary predisposition to gout, had been accustomed to drink pretty freely of porter and gin, as much as four pints of the former, and half-a-pint of the latter daily, sometimes more. About five or six years since, when going upstairs with a heavy weight, his foot slipped from one stair to the next, but he did not consider that he had hurt himself; about two or three days after, the ball of the great toe became very painful, red, swollen, and hot, and the attack lasted from three weeks to a month, no treatment being adopted except rest in bed; since that period he has occasionally had pains in this joint, but has never been again laid up with it. Although there has been but one distinct attack, the joint is completely anchylosed. About eleven months ago he had pain and swelling of the right ankle, and also of some of the joints of the fingers, several of which were left partially anchylosed. The attack for which he came under my care, and which was apparently caused by an operation for hæmorrhoids, commenced about ten days previously, with pain in the right ankle and two of the fingers of the left hand; two days after the pain left the right and attacked the left ankle, and subsequently the knee on the same side. At the time he was first seen, there was considerable swelling of the first phalangeal joint of the middle finger, and pain was occasioned on attempting to move it; the ankles were only slightly swollen, but tender on pressure. One of the phalangeal joints implicated during the last attack was found swollen and stiff, and appeared to be partially anchylosed.

Several instances have come under my notice, of patients who, although free from all visible deposits, still have one great toe or some other joint completely rigid, the result of a few attacks of gout; on the other hand, many have repeated attacks without the slightest approach to anchylosis; the difference in these cases, doubtless, depends partly on the structures of the joint which have been implicated, and partly on the greater or less disposition in the system to throw out large amounts of urate of soda.

The appearance presented by the great toes in two instances of anchylosis, are described in Chapter VII.

Before concluding this chapter, I cannot refrain from giving the passage from Sydenham, in which he describes a gouty fit; the description is graphic and vivid, the result of acute and severe personal suffering:—

"Towards the end of January or the beginning of February, suddenly and with scarcely any premonitory feelings, the disease breaks out. Its only forerunner is indigestion and crudity of the stomach, which troubles the patient for some weeks previous to the attack. His body also feels swollen, heavy, and windy—symptoms which increase from day to day until the fit breaks out. But a few days before this, torpor comes on and a feeling of flatus along the legs and thighs. Besides this, there is a spasmodic affection, whilst the day before the fit the appetite is unnaturally hearty. The victim goes to bed in good health and sleeps. About two o'clock in the morning he is awakened by a severe pain generally in the great toe; more rarely in the heel, ankle, or instep.

This pain is like that of a dislocation of the bones of these parts, and is accompanied by a sensation as of chilly water poured over the membranes of the suffering joint. Then follow chills and shivers, and a little fever. The pain, which was at first moderate, becomes gradually more intense, and while it increases the chills and shivers die out. Every hour that passes finds it greater, until at length at night-time it reaches its worst intensity, and insinuates itself with most exquisite cruelty among the numerous small bones of the tarsus and metatarsus, in the ligaments of which it is lurking. Now it is a violent stretching and tearing of the ligaments—now it is a gnawing pain, and now a pressure and tightening. So exquisite and lively meanwhile is the feeling of the part affected, that it cannot bear the weight of the bedclothes nor the jar of a person walking in the room. Hence, the night is passed in torture, and a restless rolling, first to one side, then to the other, of the suffering limb, with perpetual change of posture, the tossing about of the body being as incessant as the pain of the tortured joint, and being at its worst as the fit is coming on. Hence the vain efforts, by change of posture, both in the body and the limb affected, to obtain an abatement of the pain. This comes only towards the second or third hour of the morning (a whole day and night after the first outbreak of the fit), such time being necessary for the moderate digestion and dispersion of the peccant matter. The patient then has a sudden respite, which he falsely attributes to the last change of position. A gentle perspiration is succeeded by sleep. He wakes freer from pain and finds the part recently swollen. Up to this time, the only visible swelling has been that of the veins of the affected joint. Next day (perhaps for the next two or three days), if the generation of the gouty matter have been abundant, the part affected is painful, getting worse towards evening and better towards morning. A few days after, the other foot swells, and suffers the same pains. The pain in the latter regulates the state of the one first attacked, for the more acutely it is tortured the more perfect is the abatement of suffering and the return of strength in the other. Nevertheless, there is a repetition in the second case of all the misery of the first, both as regards intensity and duration. Sometimes, during the first days of the disease, the peccant matter is so exuberant, that one foot is insufficient for its discharge. It then attacks both, and that with equal violence. Generally, however, it takes the feet in succession. After it has attacked each foot the fits become irregular, both as to the time of their coming and as to their duration. One thing, however, is constant—the pain increases at night and abates in the morning. Now a series of lesser fits like these constitute a true attack of gout—long or short, according to the age of the patient. To suppose that an attack two or three months in length is all one fit is erroneous. It is rather a series of minor fits. Of these the latter are milder and more limited in their extent than the former, so that the peccant matter is discharged by degrees, and recovery follows. In strong constitutions, when the previous attacks have been few, a fortnight is the length of an attack. With age and impaired habits gout may last two months. With *very* advanced age, and in constitutions *very* much broken down by previous gout, the disease will hang on till the summer is far advanced. For the first fourteen days the urine is high-coloured, has a red sediment, and is loaded with gravel. Its amount is less than a third of what the patient drinks. During the same period the bowels are confined. Want of appetite, general chills towards evening, heaviness, and a troublesome feeling even in the parts which are free from the attack, attend the fit throughout. As it goes off, the foot itches intolerably, mostly between the toes; the cuticle scales off, and the feet desquamate, as if venomed. The disease being disposed of, the vigour and appetite of the patient return, and this in proportion to the violence of the last fits. In the same proportion the next fit either comes on or keeps off. Where one attack has been sharp, the next will take place that time next year—not earlier."

CHAPTER III.

CHRONIC GOUT:—NOT A CONSTANT SEQUEL TO THE ACUTE AFFECTION—DESCRIPTION OF—CONSTITUTIONAL SYMPTOMS—ALTERATIONS OF STRUCTURE PRODUCED BY CHRONIC GOUT—NATURE OF THE SO-CALLED CHALK-STONES OR TOPHACEOUS DEPOSITS—THEIR MICROSCOPIC AND CHEMICAL CHARACTERS—THEIR FREQUENT OCCURRENCE—SITUATION OF—UPON EARS—OFTEN USEFUL IN DIAGNOSIS—AROUND JOINTS—WITHIN BURSÆ—CAUSING MUCH DEFORMITY—ILLUSTRATIVE CASES—GOUTY ABSCESSES—MR. MOORE'S DESCRIPTION OF—CIRCUMSTANCES LEADING TO THE FORMATION OF EXTENSIVE CHALK-LIKE DEPOSITS—SYDENHAM'S DESCRIPTION OF CHRONIC GOUT.

THE boundary line between acute and chronic gout is completely arbitrary; nevertheless, when the disease has made a great inroad into the constitution, and its attacks have become frequent, the affection assumes a form to which the term Chronic Gout may properly be applied; and though it may not cause such excruciating suffering as the more rare and intense visitations of the acute disease, still, by its protracted duration, it is apt to induce a depraved state of the whole system, and by leading to distortion and rigidity of the joints, the formation of chalk-stones and other sequelæ, embitter the life of the sufferer to such an extent that, as Heberden forcibly remarks,—"That gout causes premature death, when all the comforts of life are destroyed, and the physical powers either insensibly undermined or suddenly crushed by an attack of paralysis or apoplexy, should hardly be reckoned among the misfortunes attending the disease." It must not, however, be assumed that gout always leads to such terrible results, for, when the constitution has been originally good, when little or no hereditary predisposition exists, and no great depressing cause or improper treatment has subsequently induced a shattered condition of the system, instead of the attacks increasing in frequency, they may become more and more rare, and even after a lengthened period, little injury may have resulted from them. A gentleman, who died a few years since, under my care, at the advanced age of eighty-four, had suffered from gout for more than half a century, but the upper extremities had been always exempt: no chalk-stones, stiffness, or deformities were visible; and during the latter part of his life the fits were slight, and the intervals long. Many cases in which gout had lasted from thirty to forty years, without producing any appreciable amount of injury, have come under my observation.

In the other and less favourable class of cases, the disease gradually becomes more frequent and irregular in its visitations; instead of occurring annually, or half-yearly, only a month or two may elapse between the attacks, and as these are generally more prolonged than in acute gout, a fresh fit will frequently ensue before the subsidence of the preceding one, and thus the patient is scarcely free, except during a few of the summer months. The joints are usually swollen from effusions into the bursæ, and more or less stiffened; there may be neither redness nor increased heat, and comparatively little pain; with an absence of febrile excitement, except perhaps a little at night, when an increase of pain usually ensues. Although there may be no fever, yet muscular and nervous pains, cramps, acidity, heartburn, pyrosis, flatulence, weight and pain after food, palpitation of the heart, constipation, deficient or depraved secretion of bile, lowness of spirits, and so forth may be present in an exaggerated degree; causing sallowness of the complexion, emaciation, and much impairment of the general health. The urine, at first scanty and of a high colour, and throwing down a heavy sediment, becomes copious, pale, and clear, or, if deposits occur, it is only after some febrile exacerbation; a trace of albumen is very frequently present.

Chronic gout is at times confined to one or two joints, but sometimes numerous articulations are involved; occasionally it leaves the joints and attacks other and more important structures. When limited to a few joints the disease is likely to produce permanent local mischief, but when it assumes the erratic form, the more serious effects described under misplaced and retrocedent gout, are prone to occur.

Chronic gout seldom continues in one locality for any length of time without giving rise to serious and permanent change of structure, consisting either in the production of partial or complete anchylosis of the joints, or the formation of the so-called chalk-stones, either around the articulations, or in other parts of the body.

Before describing these modifications, it will be well to allude to the nature and composition of the chalk-like deposits, as their occurrence is completely pathognomonic of the disease, being never found in any other malady than genuine gout. They are called chalk-stones, and hence the variety of the disease in which they are seen is sometimes designated chalk-gout: other names have been occasionally applied to them—as tophi, a word derived from the Hebrew, and implying concretion. The term chalk-stone is, strictly speaking, erroneous; it was first used when the deposited matter was supposed to consist of chalk, but we now know that no such ingredient exists in its composition, and that when pure it may be altogether devoid of lime. Although the older physicians were entirely ignorant of the true nature of this chalk-like matter, their ideas as to its pathological relations were not so erroneous, as has been generally supposed; for the ancient writers, including Sydenham and all other authors belonging to the school of humoral pathology, considered the deposit to be undigested gouty matter, thrown out around the joints in a liquid form, and afterwards becoming hardened.

The consistence of these deposits varies exceedingly; sometimes they are soft, at other times as hard as chalk itself; in order to demonstrate their true character, we will examine them carefully in both conditions.

A little white spot is often observed upon the helix of the ears of patients suffering from chronic gout, which, if it has been recently formed, gives rise, when punctured with the point of a lancet, to the exit of a cream-like exudation. This matter, when covered with a film of glass, and placed under the microscope, exhibits the appearance shown in Plate V., fig. 3, and consists of a clear fluid containing a great number of acicular crystals, exceedingly small, and requiring considerable magnifying power, and good definition to show them distinctly; with these crystals a few blood discs are frequently mixed, arising from the slight injury to the skin. If a little of the white exudation be heated with a few drops of dilute nitric acid upon a porcelain dish, and when almost dry exposed to

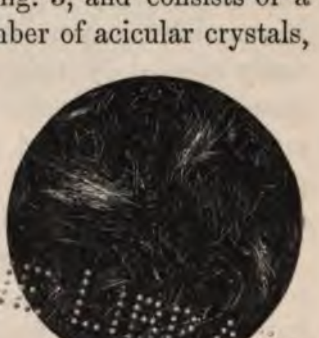

Fig. 1.*

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* Fig. 1. The appearance presented by a drop of the cream-like fluid obtained by puncturing a recently formed urate of soda deposit. That in the drawing was obtained from the knuckle of a patient whose case is described in the present chapter. Linear magnifying power 220, polarised light.

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the vapour of ammonia, a beautiful purple colour is produced from the formation of murexide, or purpurate of ammonia; if, on the other hand, it be dried and incinerated, a little alkaline ash is left, exhibiting all the reactions of soda. Under polarised light, the appearance presented resembles that seen in fig. 1. The white matter is sparingly soluble in hot water, and its solution, on cooling, deposits needle-like crystals of urate of soda, usually arranged in balls or tufts (Plate V., fig. 4).

If a concretion in a semi-solid condition be examined, the same appearance is exhibited, except that the crystals are more aggregated together and the masses are sometimes difficult to separate from each other; but this can be effected by putting a drop of water upon the slide, and using a little pressure upon the upper glass.

These white deposits can be thus shown to consist essentially of urate of soda, but, when embedded and hardened in any tissue, animal and earthy matters may become intimately united with them; a separation can be easily effected by treating the mass with hot water, and dissolving out the urate of soda. A small portion of the uric acid is now and then found in combination with potash or lime derived from the tissues, but the amount of such salts is usually insignificant.

It is probable that, when first thrown out the matter forming the deposits is in the form of a limpid fluid, but, being rich in urate of soda, it rapidly assumes a milky appearance from the crystallisation of that salt; in time, however, the watery portion is absorbed, and the concretions gradually harden until they acquire a very firm consistence.

Dr. Wollaston, in 1797, discovered that chalk-stones were composed principally of uric acid; since that time there have been several analyses made of concretions

Pl. 1.

Fig. 1.

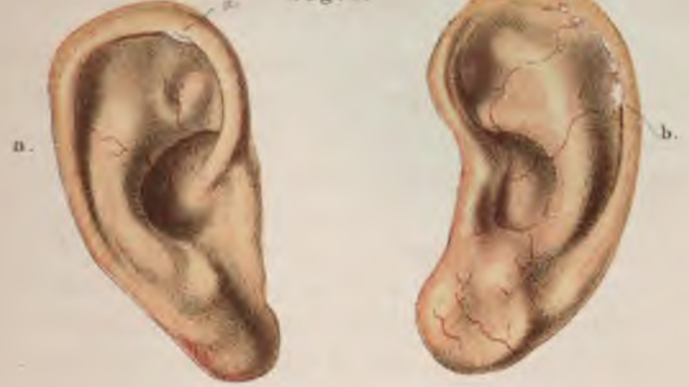


Fig. 2.

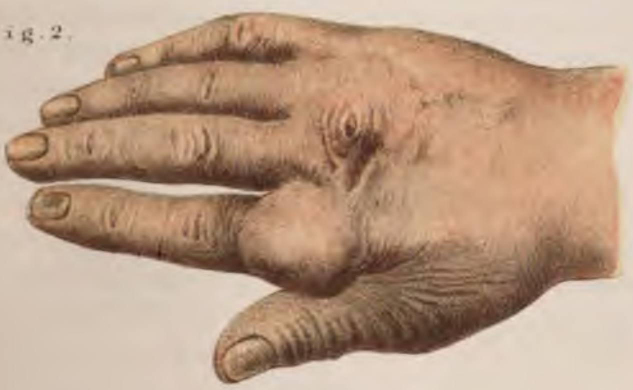
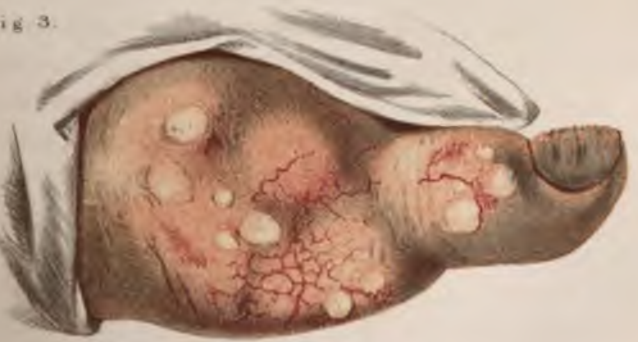


Fig 3.



G. H. Ford. Mintern Bros. Chromo.

London, Longmans Green & Co.

from different parts of the body; one, by Marchand, from the femur, was found to consist of:—

Urate of soda	34·20
Urate of lime	2·12
Carbonate of ammonia	7·86
Chloride of sodium	14·12
Animal matter	32·53
Water	6·80
Loss	2·37
	100·00

An analysis, by Lehmann, of a concretion from the metacarpus of a young man who had suffered from gout, was found to contain a great number of four-sided prisms of urate of soda, and when dried yielded the following results:—

Urate of soda	52·12
Urate of lime	1·25
Chloride of sodium	9·84
Phosphate of lime	4·32
Cellular tissue	28·49
Water, loss, &c.	3·98
	100·00

There are other analyses, as those of Laugier, Wurzer, and L'Heretier, which closely agree with each other and prove that these deposits are rich in uric acid and soda, but contain other substances in small quantities, as phosphate of lime, chloride of sodium, and organic matter. L'Heretier found a large per-centage of phosphate of lime, but gave no details concerning the situation of the concretion.

As before observed, there can be no doubt that the essential component in gouty deposits is urate of soda, which, in every one of the numerous examinations I have made, was always found to exhibit a crystalline form;

the large amount of phosphate of lime occasionally met with, is probably derived, not only from the tissue in which the chalk-stone has been developed, but likewise from secondary deposition, the result of ordinary inflammation around the original nucleus which acts as a foreign body, and which therefore, as in the case of cretaceous tubercles in the lungs, must be regarded, not as related to the disease as gout, but simply as the result of common inflammation.

Having given a minute account of the intimate structure and composition of gouty deposits, we will next describe the alterations which they produce in and around the joints and elsewhere.*

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* The following is an extract from a note appended to the French edition of the present work by Dr. Charcot, and gives in a concise form the character of the deformities in chronic gout and rheumatoid arthritis :—

"The permanent deformities of the joints which occur in certain cases of chronic gout present themselves under apparently very different aspects ; they can, however, be brought under two principal heads : the one class resulting either from the unnatural attitudes which the sufferers instinctively adopt with a view to avoid all movements which can arouse or intensify the pain in the joints, or—as is more often the case—from the spasmodic and sometimes painful retraction which certain muscles undergo owing to a sort of reflex morbid action which is excited by the joint disease ; the other class originates from the presence of those lumps of urate of soda deposited outside the joints, and which are commonly called, when they reach a certain size, by the name of chalk-stones. These two kinds of deformity, moreover, can be met with either separately or, on the other hand, may co-exist in the same individual.

"I. Simple angular deflection, or, in a more severe phase, partial dislocation of the bones, whose extremities tend to protrude under the skin, constitutes the first class of deformities. The joints are sometimes more or less rigid, or even completely anchylosed ; sometimes they still preserve a certain amount of mobility, and then the movements communicated to them are at times accompanied by a cracking noise. They may be absolutely free from swelling, for example, when the extra-articular urate deposits either do not exist at all, or only mere traces of them, or when only the articular cartilages are invaded by the urate of soda. It may even happen that the parts which are rendered immovable in consequence of the rigidity of the joints, undergo in the end a thorough atrophy, and then, too, especially in the hands, in certain cases of rheumatoid arthritis, the skin which covers these parts is pale, shining, and polished ; as though it were retracted and welded, so to speak, to the subjacent tissues. The gouty deformities here mentioned, chiefly when they affect the upper extremity in a symmetrical manner, are not essentially distinguishable, Slight deformities are often seen; and a very common one, in the hands, consists of a swelling over the carpo-phalangeal joints of the index and middle fingers; a deformity well shown in Plate I., fig. 2; probably this swelling is sometimes caused by blows, to which this part of the hand is peculiarly liable. Partial or even complete anchylosis, so rare an occurrence in acute gout,

clinically, from those which are so commonly produced in the same parts under the influence of rheumatoid arthritis. Nor ought this to be wondered at, if one observes that, in the two cases, it is the same agent, viz.: the spasmodic retraction of the muscles, which seems to play the principal part in the production of the deflections.

"II. With regard to the deformities which are produced by the masses of urate of soda deposited outside and in the vicinity of the joints, they belong, strictly speaking, to gout; they are most frequently easily to be recognised; and to give but one example, when they affect the hands, they can generally be readily distinguished from the deformities which are induced in the same parts by rheumatoid arthritis. In the latter disease the deformities of the joints in general, and those of the hands especially, may be referred to several causes; they depend partly on the existence of bony growths developed on the circumference of the articular surfaces, and partly on the partial dislocation of the bones whose rounded ends protrude beneath the skin. Consequently, if we except the very exceptional case where there are movable foreign bodies near the surface, the nodosities in this latter disease do not form separate swellings; they form, in fact, one mass with the bone, and have the same consistence, in a word, they are the bony extremities themselves, more or less swollen and deformed. Quite different from this is chronic gout, for there the deformity is the result of chalky concretions; these show themselves in the shape of irregularly rounded or ovoid swellings, bunched, and either large at the base or just the opposite, *i.e.*, provided with a pedicle (fig. 3). These swellings, which have been known to reach the size of a pigeon's or a small hen's egg (Pl. II.), come up especially on the back of the hand; they are independent, up to a certain point, of the subjacent tissues, and are slightly movable in a lateral direction. While they are of recent growth they are softish, and never quite attain to the hardness of bony tissue; the position they generally choose is one in the vicinity of the first phalangeal or the metacarpo-phalangeal joints, but not always exactly at the level of these articulations, nor do they copy their shape and contours. The skin which covers them is stretched and glossy and often becomes adherent to them, in which case it is speckled with round spots of a dead white colour, which clearly prove the presence of urate of soda (Pl. I., fig. 3). Lastly, one more characteristic feature is that the fingers, when they become warped, owing to the pressure put upon them by the chalky swellings, do not exhibit such distortions of contour as can be grouped under a definite number of clearly-marked types, and the disease, in this respect also, differs from rheumatoid arthritis (compare figs. 2, 3, 4, and Pl. I., fig. 2, and Pl. II., with fig. 25)."

frequently supervenes in its chronic forms; sometimes there is but little bulging or enlargement of the stiffened joint, but there is often a fair amount of swelling; and when this occurs in the small joints of the hand it gives rise to the appearance represented in fig. 2.

In the hand from which the drawing was made, not only was there sufficient deposit to cause bulging, but little white points could be seen here and there, especially about the palmar ends of the fingers, showing the close approach of the urate of soda to the surface. When there is no enlargement, a very peculiar and angular form of distortion of some of the phalangeal joints often ensues, so well described in the above foot-note, and characteristic either of this disease or of one form of rheumatoid arthritis.

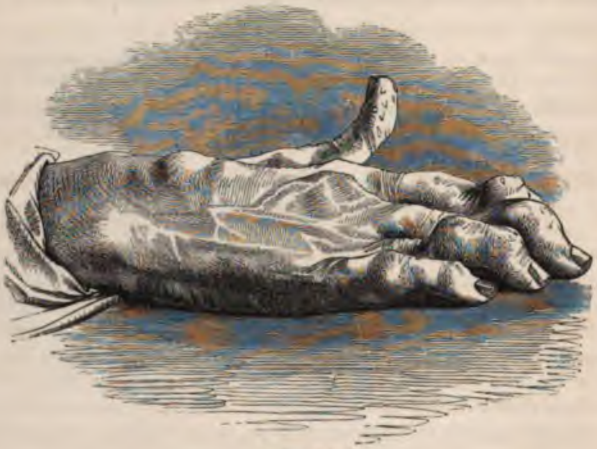

Fig. 2.*

Comparatively few gouty patients become the subjects of visible chalk-stones, at least to the extent of producing deformity, but I am convinced that their occurrence in a slight degree is by no means so rare as has been hitherto assumed. Scudamore stated that in five hundred cases of gout he only found them forty-five times, or in less than ten per cent. From my own experience I consider these numbers far below the real proportion, feeling confident that their existence is frequently overlooked, from their being deposited in parts of the body scarcely to be expected. Small concretions were mentioned by some writers, as Ideler, M. Fauconneau-Dufresne, and Scudamore, as having been seen upon the cartilages of the ears, but no particular notice was taken of the fact. About twenty-one years since I specially investigated this point, and found that, instead of such deposits being but rarely present on the ear, they are more frequently seen there than in any other situation;* and that when they are visible upon any other part, they are usually seen on the ears also.

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* Fig. 2. A drawing from the hand of a patient suffering from chronic gout of many years' duration, and representing a condition not unfrequently met with

In thirty-seven gouty patients who were examined at that time to ascertain the presence or absence of concretions of urate of soda upon the surface, or in some situations in which they could be undoubtedly recognised, it was noted, that they were present in seventeen cases, absent in twenty; in the above seventeen, they occurred in the ears alone in seven cases, in the ears and around the joints in nine, and in one case only could they be recognised in other parts of the body, without being present in the ears likewise.

I may mention that I have seen several remarkable exceptions to this rule within the last few years; cases in which extreme deposition had taken place about the joints and in the bursæ of the elbows, but not a trace of urates could be discovered in any parts of the external ears. Sometimes the spots are single, sometimes numerous; they are often smaller than a pin's head, but now and then as large as a split pea, or even larger. They have the appearance of little pearls, and are generally situated about the fold of the helix, usually easily seen, but occasionally requiring the helix to be a little unfolded; sometimes they are hard and gritty, but more frequently soft, and when punctured give exit to a milky fluid. At times other parts of the external ear, have like deposits. Further examination shows that when hardened they become firmly attached to the cartilage of the ear, and enlarged blood-vessels are often seen in their neighbourhood, and even extending some distance from them.

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* Medico-Chirurgical Transactions, volume xxxvii., 1854.

It is a curious circumstance that the ears of women suffering from gout seldom exhibit these deposits, even when the joints have been seriously injured. I have as yet only met with two cases in which they were present.

In Plate I., fig. 1, *a*, a man's ear is represented having but one of these points; it was the only external evidence of chalk deposit which could be discovered.

The following is an abstract from the history of his case :—

1854.—J. E., aged forty-three, a gardener, with no hereditary predisposition to gout; has lived well, drunk freely of porter, and now and then taken spirits. The first attack of gout came on when he was thirty-one years of age, and was confined to the ball of one great toe, lasting about a week; the second attack was likewise in the same joint, and occurred about a year afterwards; the fits subsequently returned more frequently, and the ankles, knees, and hands became involved. About ten weeks before he was under my care he felt chilly and feverish, with pains in the head and oppression of the chest; one of his wrists inflamed, and the head was relieved; about a fortnight after his recovery from this attack, which lasted a month, he had an affection of one ankle and great toe. On my seeing him, the toe was still tender, pitting a little on pressure, with signs of commencing desquamation of cuticle. There were no chalk-stones observed around the joints, and no deformity or stiffness of any of the articulations which had been previously implicated; but at the upper part of the helix of the right ear a pearly white spot was seen, about the size of a small millet seed.

Plate I., fig. 1, *b*, also represents the ear of a gouty man, in whom the disease was much further advanced, and several other concretions were seen on different parts of his body.

The following is a very condensed history of this patient's case:—

1855.—J. D. M., a man about fifty-eight years of age, not inheriting gout, has been engaged for many years in a cook-shop, and has lived well, taking much meat, and drinking freely of porter and gin. For the last twenty-five years he has suffered from gout, at first in one or other great toe, and at intervals of a year or two, but after a time the attacks increased in frequency, and many joints were affected. For more than twelve years he has had rigidity and distortion of some of his joints, especially of the hands, and chalk-stones have formed, some of which have been discharged by ulceration. Upon both ears many little white points are seen, and the blood-vessels leading to them are distended; he had frequently observed that before a fit the ears became painful. During the many years this patient was under my observation, the appearance of the ears greatly changed, owing to the detachment of some of the old nodules, and the formation of new ones; when recent they were liquid, exhibited a beautiful crystalline appearance under the microscope, and yielded murexide with nitric acid and ammonia. The blood of this patient was examined two or three times, and found loaded with urate of soda; the urine was slightly albuminous during severe attacks, but not in the intervals: its analysis is given in a subsequent chapter.

I have seen several patients with ears much more extensively affected, both as regards the number and size of the deposits. One gouty gentleman at Vichy, who was undergoing a course of the waters, exhibited a row of from ten to twelve beads, like large pearls, arranged along the edge of the helix of one ear.

The presence of deposits in the ears deserves attention, as it may prove of considerable service in the diagnosis of doubtful cases; I would observe that when I have failed to find them in the ears of men when present elsewhere in the body, it has been in individuals in whom these organs were unusually warm. The deposits are probably formed during an attack of gout, but occasionally they appear shortly afterwards; in one case, of which I have notes, the ears were carefully examined without result when the patient left the hospital, but within ten days, on a re-examination, a deposit was found; perhaps some fluid was effused during the fit, but being at first transparent could not be easily distinguished. Patients with these auricular deposits not uncommonly feel pricking and pain in their ears at the commencement of an acute gouty attack, as in the case above related.

In only a few instances have I met with a patient in whom the ears appear to have been first attacked with gout, and exhibited deposits of urate of soda before any articular disease had developed itself. As cases of this class are interesting in many points, I will give a short abstract of one :—

1861, July.—J. T., a man aged 58, came under my care in the hospital; he is married and has had ten children; was a relieving officer for twenty-one years, which appointment he resigned three years since on account of ill-health. He inherits gout from his father, and one of his sisters is likewise subject to it Has been accustomed to take malt liquors, about a quart each day, but states that he has always been temperate, but very irregular as to his meals; when about seven years of age is reported to have had rheumatic fever. About twenty years since he experienced his first attack of gout, which he describes as commencing in the right hand, but the next day the ball of the right great toe became affected, and soon afterwards the left foot and both knees; the disease travelled from feet to knees, and back again from knees to feet, the fit lasting about eight weeks. Two years afterwards he had a second attack, and then at intervals of from one to three years. In the pursuit of his occupation he was several times thrown out of his gig, and after each fall gout invariably occurred.

About ten years since, deposits commenced forming in the hands and feet, but the patient affirms that even as long ago as twenty-five years, that is, five years prior to any distinct attack of articular gout, he had noticed nodules on his ears.

When admitted into the hospital he was suffering from extensive deposits, which were seen in both hands, many of the finger joints being greatly distorted and nodulated; a large lump was felt in the bursa of the left elbow. The hips, knees, and ankles apparently uninjured, but the feet much deformed, the right great toe joint considerably enlarged, and a mass of deposited matters the size of an egg extended over the metatarsal bones: there was a deposit likewise on the heels. The left foot was much swollen from urate deposits on each dorsal surface, and from many points pus was seen exuding mixed with chalky matter; several white points were seen on the left ear, and one on the right ear. The urine gave on analysis scarcely a trace of uric acid, sp. gr. 1010, with a small amount of albumen.

In the two or three other instances which have occurred in my practice within the last thirteen years, patients have assured me that they had noticed deposits upon their ears some years or more before any well marked gout had occurred in any joint, though they might have previously experienced indigestion and other premonitory symptoms, and even have felt twinges of pain in their toes. Dr. Charcot, in a note to the French edition of the present work, relates the case of a man 35 years of age, who was suffering for some months from acid dyspepsia, and in whom he predicted a fit of gout from noticing a urate concretion in one ear.

Gouty concretions are commonly situated upon the hands and feet, but the upper extremities are more affected than the lower. In 1858 a gentleman was under my care whose case well illustrates the rapid development of these deposits. He was about 63 years of age, healthy, except that he had suffered from gout during the last twenty-five years; at first the attacks were confined to the great toes, they then gradually affected the feet, ankles, and knees, but latterly the hands were also involved. He had an attack in the spring more lengthy than usual, and he then for the first time observed that some of the articulations of the fingers remained slightly crippled; in this condition he applied to me. The last phalangeal joints of two or three fingers were stiffened, partially anchylosed, and a little swollen; but on the dorsal surface of the second phalangeal joints of three fingers small rounded protuberances were observed, the skin over them being red; these bulgings appeared soft, as if containing a thick fluid, but not the slightest indication of white matter could be seen through the skin; they might have been either gouty concretions in their early stage of formation, or some other form of swelling; from a simple inspection I could form no opinion as to their true nature; but the history convinced me that they arose from a deposit of urate of soda. Upon puncturing one of the little swellings, full light was thrown upon the case, as a thick white fluid immediately exuded, a drop of which placed under the microscope, with the use of polarised light, gave the appearance represented in fig. 1; the crystals were proved by analysis to consist of urate of soda.

Swellings of this kind, as they increase in size and become more solid, usually approach the surface; the skin then becomes thinner, and the peculiar white appearance is seen, which at once reveals their character. This phenomenon is well depicted in the drawing of the great toe (Plate I., fig. 3). The history of the man from whose toe the drawing was made is shortly this:—

1854.—T. C., aged 57. A house painter for forty-three years. Has lived well and drunk freely. His general health had been good till within the last twelve years, when he fell from a scaffold and shortly afterwards had lead colic. Gout then commenced in the great toe, and the attacks have of late years much increased, both in severity and frequency; not only on the ears, but also around other joints of the body besides the toe, urate deposits are visible, some of them of considerable size.

Joints around which chalk-stones have formed, become distorted in proportion to their number and extent, until at last the most fearful crippling occasionally ensues; such, for example, as is represented in the hand in Plate II.

This unfortunate patient, J. E., at the time that the drawing was made of his arm and hand, was sixty-seven years of age; since his boyhood he had lived as servant in different families. At the age of thirty-six he had his first attack of gout in the great toe, and for many years the fits returned at short intervals: when about the age of fifty-three, tumours formed on the fingers and elbows, and subsequently about the joints of the feet; these swellings gradually increased in size, and after a while a fluid of the consistence and colour of cream was discharged from some of them. The tumours on the hands and elbows were considerably larger than those on the feet and knees; the movements of the elbow-joint were not much interfered with, but those of the hands were greatly impeded. The patient's mother, grandmother, and brother, were affected with gout, but in a less degree. I have in my possession a chalk-stone taken from this man, which in a fresh state weighed more than two ounces avoirdupois.

These exaggerated forms are not very commonly met with, although within the last few years I have seen many cases in which the hands were almost as much disfigured as in the above.

The various bursæ mucosæ are very liable to become inflamed during an attack of gout, and after the acute inflammatory action has passed off, may remain distended; this distension arises from a fluid having been secreted in their cavities, a fluid which often gives rise to a deposition of solid matter, and hence results the formation of permanent chalk-stones. The bursa over the olecranon process of the elbow-joint is peculiarly prone to be thus distended, and in many cases we find its walls thickened and a little hard nodule is felt in the interior; sometimes, from repeated attacks, it becomes enormously distended, as is well shown in Plate II. When no solid matter can be felt through the walls of these enlarged bursæ, they will occasionally, if punctured with a fine instrument, give rise to a fluid exudation, having the crystalline characters already described. The following case, which recently occurred in my practice, well illustrates this fact:—

1858.—W. F. A man aged sixty-one has had gout for fourteen years. The first, and also several subsequent attacks, were confined to the ball of the great toe of the right foot, the left great toe then became affected, and afterwards the elbows. No deposits of chalky matter were anywhere visible, but the bursa over the left olecranon process was enlarged and prominent; the walls were thickened, and felt somewhat elastic, and the skin red; the patient had suffered very recently from an acute attack in one of the great toes. Some little doubt existing as to the character of the fluid within the sac, it was carefully punctured, and nearly half a drachm of a white matter exuded, which exhibited the characteristic crystalline appearance we have so often referred to, due to the presence of innumerable prisms of urate of soda.

The bursa about the knee-joint is also liable to distension, and permanent enlargement may result from the deposition of gouty matter. I had once under my care a patient who exhibited this deformity, and likewise a remarkable distortion of one finger, represented in fig. 3. The history of the case is as follows:—

October, 1858.—J. B., a man aged forty-three, by trade a plumber, having no known hereditary predisposition to gout; temperate in his habits, but accustomed to take about two pints of porter a day; has suffered severely from gout for twelve or fourteen years, chiefly in spring and autumn; the first attack, which affected the great toe, occurred as far back as twenty years ago; after this he had a respite of some duration. About ten years since, the disease made its appearance in a more general form, many joints, besides the great toe, being implicated; from this time the disorder became frequent in its visitations, and serious in character.

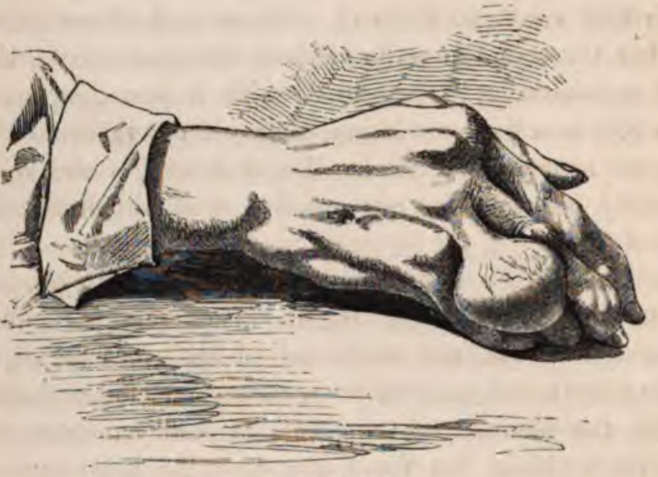

Fig. 3.*

About five years ago, he noticed enlargement of the first phalangeal joint of the fourth finger of the left hand, apparently induced by running a piece of glass into it, but subsequently deposits appeared in many other situations. When the patient came under my care the following notes of his condition were taken :—a distinct blue line is seen on the free margin of the gums, which, as well as the lips and surface, are somewhat anæmiated; he has never had lead colic. Upon the helix of the right ear two small white spots are observed and deposits can be distinctly felt in the bursa over the left elbow; both hands are much deformed, many of the phalangeal joints are anchylosed, and here and there the deposits approach so near the surface as to resemble white patches. The first phalangeal joint of the fourth finger of the right hand is most deformed, and swollen almost to the size of a small hen's egg, the long diameter of the tumour being transverse, and overlapping the fingers on each side, as shown in the engraving, fig. 3. The swelling is red, tense, and shining, the blood-vessels distended, and gives a sensation to the touch of being composed partly of solid, partly of semi-fluid matter. This tumour has been increasing for many years, and consists of urate of soda of different degrees of consistency. Both ankles and the right foot are enlarged, but not œdematous; on several of the toes little white points are seen, from which chalky matter has formerly exuded; the bursa over the patella of the left knee is much enlarged and bulging, with several white spots where the deposit has approached the surface, and from which some has occasionally been discharged. The urine is pale in colour and rather abundant, its average specific gravity 1010, and during an attack of acute gout, slightly albuminous; it also exhibits both granular and waxy casts.

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* Fig. 3. A drawing of the hand of a patient in which the first phalangeal joint of the fourth finger of right hand is shown extremely enlarged from the deposition of urate of soda.

Not uncommonly, especially among workmen who are accustomed to use their hands in grasping tools, white deposits are seen on the palmar surface of the ends of some of the fingers, on account of the matter which was originally deep-seated becoming more superficial from constant friction, and I have recently observed similar deposits in the right hands of gentlemen who had been in the habit of writing much. I have also seen the same appearances in the hands of a lady.

Sometimes small nodules of urate of soda are found upon the eyelids, and now and then in the integuments of the face; they have been seen on the side of the nose, of considerable size; and in one instance I observed a true gouty deposit as large as a split-pea, apparently attached to the fibrous structure of the corpus cavernosum of the penis.

With regard to the white-looking deposits which often occur about the eyelids and the integuments of the face, I may remark that some care is necessary before deciding upon their nature, as they are seen in subjects who have never had gout, as well as in gouty patients, and may be in no way connected with the disease, merely consisting of epidermic scales mixed with fatty matter and cholesterine. I have recently examined two deposits from the same individual, a martyr to gout; one taken from the helix of the ear, the other from the under eyelid; that from the ear was crystalline and consisted of urate of soda; that from the eyelid was simply sebaceous.

Dr. Routh once kindly sent for my inspection a young woman having a nodule upon the left ear, about the size of a small bean; it had all the outward appearances of a urate deposit, was somewhat hard, very white and opaque; but when punctured the contained matter was found to consist of epidermic scales and fat, and to yield no trace of uric acid. The patient, about twenty years of age, was not descended from gouty parents, and had never suffered from any articular disease.

After patients have suffered from gouty concretions for a long time, it is not uncommon to find that the skin over them becomes thin, and fragments of the chalk-like matter are thrown off, occasioning but little annoyance; this often occurs in the fingers, toes, and heel, sometimes over the head of the tibia; in the ears it is of very frequent occurrence. But, on the other hand, these deposits may act as foreign substances, and set up considerable inflammatory action, accompanied with suppuration, and in this way ulceration is induced, which often proves difficult to heal; when such is the case, the discharged matter consists of small masses of urate of soda made up of acicular crystals and mixed with pus globules. My own experience would lead me to believe that the condition of the patient's general health has considerable influence in such cases in causing inflammation and suppuration around the deposits, the lower the vitality the greater being the tendency to take on inflammatory action.

A remarkable case of gouty abscess has come under my notice within the last few years; a gentleman about 68 years of age, who has long suffered from gout, had noticed for some time enlargement about the feet, but more especially over the dorsal surface of the second phalanx of the great toe; the projection on the right toe was about an inch and a half long, and half an inch broad, and was very troublesome from its interfering with the boot, and not unfrequently it inflamed and became very tender. About two and a half years since, a discharge of urate of soda took place, and the part gradually opened, till a cavity was formed about three-quarters of an inch long, one-third of an inch broad, and about half an inch deep; the walls of this cavity were very hard from infiltrated chalky matter, and each day a considerable quantity came away. After many months the walls became softer, contraction ensued, with lessened discharge; this reparative progress has continued up to the present time (July, 1875), and now scarcely a trace of the opening can be seen; still every few days a slight, though hardly perceptible, oozing takes place. This patient has during this period been unusually well, and has scarcely experienced any gouty pains.

A very interesting and valuable paper on gouty concretions, by Mr. James Moore, Surgeon to the Second Regiment of Life Guards, is contained in the first volume of the Medico-Chirurgical Transactions, 1809. In this communication the mode of formation and progress of these tumours is so graphically depicted, that I have been induced to transcribe a portion. After a few preliminary remarks as to the nature of chalk-stones, he goes on to state:—"This effusion (meaning the milky fluid containing the urate of soda) occurs not only during fits of gout, but likewise in the intervals; and as the extremities, particularly the hands and feet, are the principal seat of gout, it is there the greatest accumulation of chalk takes place. Though this process is usually preceded and accompanied by inflammation, the chalk is never inclosed in a cyst, like pus in an abscess. It lies usually in the cellular membrane, in the bursæ mucosæ, or in the cavities of the joints. I have even seen it thrown out between the cutis and the cuticle. But, as the gouty inflammation is of the erythematous kind, there is no extravasation of coagulable lymph, and no new-formed covering surrounding the chalk. This point is of the first importance, and explains many of the peculiarities of gout, which is generally considered as a phlegmon. But the absence of coagulable lymph in the inflamed parts I consider as full evidence of the inflammation being erythematous.

"The chalky liquid when first secreted gives to the finger the feeling of fluctuation, and cannot be distinguished from the ordinary serous effusion of gout. But unfortunately the absorbents cannot suck up the chalky particles. The consistence of the liquid, therefore, becomes thicker and thicker, till at last nothing remains but a hard mass. When even a considerable effusion of this kind occurs, the quantity of chalk which ultimately remains is comparatively small, as by far the greater quantity is merely serum. It therefore usually requires repeated effusions to form any great mass of chalk, and the consistency depends upon its age, and the activity of the absorbents. The quantity at last accumulated by repeated paroxysms is in some instances immense, which augments very seriously the sufferings of the gouty. The distress, however, is not owing to any irritating quality in the chalk, but to its obstructing the motion of the tendons and joints, occasioning often complete anchylosis, and pressing and distending the surrounding parts by its bulk. It acts, therefore, by mechanically embarrassing the machine of the body, and not upon the living principle; for it will often remain for years in parts highly sensible without exciting the slightest pain or inflammation. Although these concretions are of so mild a nature, they often are the cause of extensive mischief, bursting externally, occasioning ulcers very difficult to heal. When a violent fit of the gout attacks a chalky tumour, the appearance is frequently very alarming, the new paroxysm being accompanied with a fresh serous and chalky effusion, which added to the old deposit of chalk, occasions a prodigious swelling; the cutis when distended to the utmost opens, yet sometimes the cuticle remains entire. The chalky or serous liquid may then be seen through the semitransparent epidermis. The surrounding integuments appear of a deep red, or of a purple hue, threatening mortification; while the pain is excruciating.

"At length the cuticle gives way, a discharge of serum and chalk takes place, and a remission of all the symptoms usually follows. During the whole of this alarming process suppuration never occurs; but soon after the opening has taken place suppuration commences, and pus and chalk are then discharged from the ulcer. There are several unexpected occurrences in the progress of such ulcerations. When an opening is formed, the whole of the chalk never escapes, and its complete evacuation is often a very tedious process; this is owing to its being diffused through the cellular membrane, as in the cells of a sponge. One cell must sometimes give way after another, and small portions of chalk are successively thrown out, so that months and even years pass away before the whole is discharged. It also frequently happens that the orifice contracts and closes over, leaving portions of chalk underneath. This kind of cicatrix sometimes stands its ground, but more commonly breaks out again and again to discharge chalk. Even openings into joints, which are so dangerous when occasioned by other extraneous bodies, are often attended with no serious symptoms when the joint is filled with chalk. On such an accident happening, a surgeon unacquainted with these peculiarities might be tempted to propose large openings or even amputation, as the only resource for hindering extensive inflammation and carious bones. But if he treats the disease mildly, he will find that no such severe plans are requisite, for the parts will probably fall into a very tranquil or indolent state; a sore will continue for a certain period, discharging pus, and occasionally a bit of chalk, till at last the orifice will close up. Independent of the openings formed by a fit of the gout, the skin, stretched over a mass of chalk, is sometimes thinned, absorbed, and pierced by mere pressure. At other times this is effected by common inflammation and suppuration. When openings take place in these milder ways, a less quantity of chalk is usually evacuated: but this depends entirely upon the degree of inflammation. When the suppuration is great, it naturally detaches and washes out a greater quantity of chalk.

"The last peculiarity is the rarest, namely, that a dry hard piece of chalk shall pierce the skin, and remain like an excrescence, without exciting either inflammation or suppuration."

The point upon which I should feel disposed to differ most from this writer, is with regard to the non-occurrence of suppuration prior to the opening of the skin; as I have seen many abscesses formed around gouty nodules, which have at once given exits to a large amount of pus, as well as urate of soda, on being punctured; this has especially occurred in patients in a weak state of health.

It not uncommonly happens, that when patients are suffering from these abscesses, which are keeping up a constant discharge of matter, they enjoy a comparative immunity from active gout; and I have known several instances in which the healing of these abscesses was followed by a sharp attack of gout in some other part of the body, showing that the ulcers had acted as a kind of safety-valve.

Some patients appear remarkably prone to the formation of concretions, while others, even after a considerable number of gouty fits, remain entirely free; this remark, it must be remembered, only applies to deposits of urate of soda *around* the articulations, for every attack, as will be subsequently proved, produces some alteration *within* the joints. Although it is much more common to observe these deformities among men, females are by no means exempt, and I have had under my care several who exhibited them in a very marked degree; one lady, 43 years of age, had the smaller joints of both upper and lower extremities much enlarged, distorted and stiffened, and so quickly had this come on, that she had become completely crippled within three years of the first attack of gout. In a second case the deformity was much less marked, although the hands were nodulated and rendered almost useless. In a third case now under my care, the amount of enlargement of the ankles and knees is extreme, and white matter is constantly being discharged from several openings; the hands and elbows are likewise much swollen and distorted. These three cases occurred in the higher classes of society. A fourth case, which is that of a woman in a poorer condition of life, is of sufficient interest to be somewhat detailed and illustrated.

Some years since I had under my charge in the hospital a female in whom the deformity arising from gout was shown in a very extreme degree, and as her case is instructive, and in many points peculiar, I will give a short abstract from my case-book:—

M. A. F., aged forty-nine years, married, has had several miscarriages, but no family, knows of no hereditary predisposition to gout, but was always delicate; from the age of nine years until she was twenty, she lived with her aunt, in a public-house, as barmaid. She was advised to take a little port wine on account of her weakness, but she soon increased the amount till she drank a considerable quantity, nearly a bottle, each day. At the age of twenty-nine years she experienced her first fit of gout, commencing in the right great toe, but within a few days implicating the left thumb; it was not severe, and she was soon able to resume her occupation. The attacks returned at intervals, with moderate severity, until her forty-second year, when she was so extremely ill as to seek admission into the hospital, and came under my care. At this time she not only suffered from joint affection but had also severe epistaxis; concretions of urate of soda were already seen around many of the joints of the fingers and toes; and the urine was very pale and of low specific gravity. After remaining in the hospital about two months she left much relieved, and was lost sight of until her re-admission in June, 1861; during this interval, a period of eight years, she had suffered from repeated fits of gout, and gradually increasing deformity from the rapid deposition of chalk-stones. The state of her joints was now frightful, the hands completely crippled, the fourth finger only being moveable, or in the least approaching the natural shape. A representation of the left hand is seen in fig. 4. The left elbow was

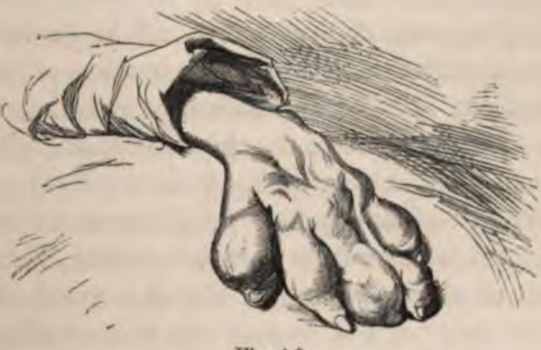

Fig. 4.*

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[*] Fig. 4. A drawing of the left hand of a woman suffering from extreme chalk-stones in nearly every limb.

swollen from a deposit over the olecranon process, the knees enlarged and deformed, and both feet greatly distorted; on the metatarsal bone of the right great toe was a large mass of chalky deposit, about $2\frac{3}{4}$ inches in length, and $1\frac{3}{4}$ inches in breadth; the left great toe was also much swollen. These appearances are seen in the annexed woodcut, fig. 5.

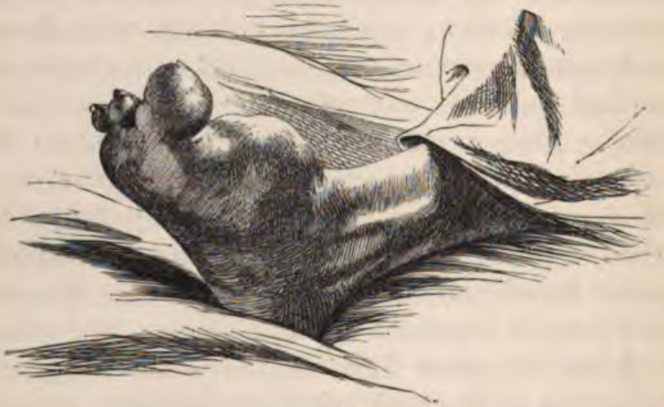

Fig. 5.*

Scarcely a trace of uric acid could be discovered in this patient's urine, and the daily excretion of urea was very deficient. Besides the deformity from the excessive deposits of urate of soda, the chief features exhibited by this patient were extreme pallor from depraved nutrition and impure blood, arising from the frequent occurrence of epistaxis, and later on from chronic vomiting, and vertigo, the result of renal deficiency; she also occasionally had attacks of dysuria, and some years since had passed a small urinary calculus.

An excessive formation of chalk-stones is, I believe, invariably connected with deficient eliminating power of

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[*] Fig. 5. A drawing of the right foot of the same woman from whom the delineation of the hand (fig. 4) was obtained.

the kidneys, as will be shown in the chapter devoted to the consideration of the urine in gout; in many cases this can be more or less distinctly traced to the influence of depressing causes, as a diet impoverished from sudden reduction of circumstances, a severe shock to the nervous system, or debility from the supervention of other diseases.

A great number of cases of chronic gout have been under my care during the last twenty-five years, illustrating different points in its history of some interest; the following are selected examples.

1851.—W. B., a man aged fifty-one, with no hereditary predisposition to gout; when about sixteen years of age went to service as steward's-room boy, afterwards became postillion, and was accustomed to drink as stablemen usually do; he was often out on the box all night, exposed to wet and cold. In 1826 he went to the Mediterranean, and travelled through France, Italy, and Switzerland, in the capacity of gentleman's coachman, and partook freely of the new wines of the countries, and also of brandy. He returned to England in 1830, quite well, but had had some brain affection when abroad from exposure to the sun. Shortly after this he experienced fits in the August of each year, which were considered to be epileptic, and these obliged him to discontinue service, and also to live very sparingly. The fits continued until 1845, when they terminated upon the occurrence of gout in the ball of the right great toe. The first paroxysm lasted about ten days, and he had no return for a year, when both feet were affected; the attacks after this rapidly increased in frequency and severity, and the hands, elbows, and knees became implicated. Soon after the first seizure in the upper extremities, he noticed some white spots in the tip of the right little finger, and not long afterwards numerous deposits took place around almost all the smaller joints of the hands and feet; nodules were also seen on the ears. At length he became completely crippled, and some of the deposits grew to a very large size, and caused ulceration of the skin, and the formation of abscesses in different parts. The urine was very pale, with a slight trace of albumen; scarcely any uric acid could be separated from it.

In this case it is very probable that the depression arising from the rapid change of circumstances and the spare diet, acted powerfully as a predisposing cause of the rapid development of the chalk deposits.

The cessation of the epileptic fits, and in fact their entire removal on the occurrence of the first attack of gout, is a circumstance the knowledge of which is of some value.

On the other hand it often happens that no depressing cause can be traced in the production of these deposits; in fact they now and then occur in patients whose constitutions are in other respects exceedingly good, and in whom the force and the duration of the disease must alone be looked for as the cause. A gentleman, about eighty-nine years of age, otherwise in robust health, consulted me with both hands and feet greatly enlarged from deposits, many of which had formed abscesses, freely discharging urate of soda.

Another case in which the gouty enlargements were excessive, the hands of the patient being almost as much deformed as that represented in Plate II., was under my care many years since.

1857.—The gentleman is sixty-one years of age, and has no hereditary predisposition to gout. In early life he lived freely, partaking chiefly of malt liquors and spirits; had a very large family, all of whom are healthy. The first fit of gout came on about thirty years since, in the ball of the left great toe; there was only an interval of half a year between the first and second visitation; several years elapsed before the knees were attacked, and a still longer period before any of the joints of the upper extremities became implicated. For the last ten years he has noticed chalk-stones, and is now extremely deformed and crippled by them; all the joints of the hands are completely studded, as likewise are both elbows. The feet are much distorted; large masses are seen on the inner side of the left tarsus, from which fragments of white matter have been discharged; and there is much thickening around each heel. Both ears are studded, and some of the nodules are of considerable size; deposits are also seen near the inner canthus of each eye.

He complains of but few uncomfortable symptoms, other than acidity and heartburn, but north winds, or the least indulgence in wine or ale, are very apt to induce fresh inflammation about some of the crippled joints.

He remembers that his urine formerly threw down a red sediment, but of late years (the last six or seven) it has become much paler and completely free from deposit; at present it is of low specific gravity, contains a distinct trace of albumen, but yields scarcely any uric acid.

Chalk-stones may be occasionally traced to injuries which, however, act simply in localising them; I have seen them on the back of the hand, the result of blows; and it is probable that the collections of urate of soda in the bursæ of the elbows, which so often occur, arise from the pressure to which these parts are subjected.

Sydenham's account of the progress of chronic gout, and of the sufferings and deformities produced by it, is equally correct and graphic with his delineation of the acute fit, and I cannot, in concluding this chapter, do otherwise than bring it before my readers in his own emphatic words:—

"When either undue treatment or attacks of a more chronic character have converted the whole substance of the body into fuel, so to speak, for the disease, and when nature is incompetent to its elimination, its course is different.

"The true seat of the disease is the foot, so much so, that when it appears elsewhere either its character is entirely changed, or else the constitution has been gradually undermined. Then, however, it attacks the hands, wrists, elbows, knees, and other parts, the pains being as the pains of the feet. Sometimes it distorts the fingers, then they look like a bunch of parsnips, and become stiffened and immoveable. This is from the deposit of chalk-stone concretions about the ligaments of the knuckles. The effect of these is to destroy the skin and cuticle. Then you have chalk-stones like crabs' eyes exposed to view, and you may turn them out with a needle. Sometimes the morbific matter fixes on the elbows, and raises a whitish tumour, almost as large as an egg; which gradually grows red and inflamed. Sometimes the thigh feels as if a weight were attached to it, without, however, any notable pain. It descends, however, to the knee, and then the pain is intense. It checks all motion, nails the patient down to his bed, and will hardly allow him to change his posture a hair's-breadth. Whenever, on account of the restlessness so usual in the disease, or from any urgent necessity, the patient has to be moved, the greatest caution is necessary. The least contrary movement causes pain, which is tolerable only in proportion as it is momentary. This movement is one of the great troubles in gout; since with perfect quiet, the agony is just tolerable.

"Up to a certain time, the gout comes on towards the end of winter, lasts for two or three months, and retires regularly. In confirmed cases, however, it lasts throughout the whole year, except only the hottest months of the summer. Furthermore the longer the attack, in general, the longer is each individual fit. Instead of a day or two, they last a fortnight. Instead of the feet only, they attack any joint indifferently. Lastly, on the first or second day after, the patient, besides the pain, has entire loss of appetite and general discomfort."

CHAPTER IV.

BLOOD IN GOUT:—ALTERED CONDITION OF THE BLOOD IN GOUT OFTEN ASSUMED BY THE OLDER WRITERS, NOT PROVED UNTIL VERY RECENTLY —COMPOSITION OF THE BLOOD IN HEALTH—ITS ALTERATION IN GOUT—GLOBULES—FIBRIN—ALBUMEN—DISCOVERY OF URATE OF SODA IN THE BLOOD—MODE OF SEPARATING URIC ACID AND URATE OF SODA FROM IT—CLINICAL METHOD FOR DETERMINING THE PRESENCE OF URIC ACID IN THE BLOOD—DETAILS AND PRECAUTIONS—DELICACY OF THE TEST —READY DECOMPOSITION OF URIC ACID IN THE BLOOD—PROBABLE CHANGES WHICH ENSUE—TABLE CONTAINING A SHORT SUMMARY OF CASES OF GOUT IN WHICH URIC ACID WAS PROVED TO EXIST IN THE BLOOD—DISCOVERY OF URIC ACID IN FLUIDS ARTIFICIALLY EFFUSED —USE IN DIAGNOSIS—SMALL AMOUNT OF UREA IN THE BLOOD IN GOUT, ALSO OF OXALIC ACID—TRACES OF URIC ACID AND UREA IN HEALTHY BLOOD—CONDITION OF THE BLOOD IN THE INTERVALS BETWEEN THE ATTACKS OF GOUT—PERSPIRATION IN GOUT—OXALIC ACID FOUND IN THIS SECRETION.

IN vain shall we seek among ancient writers, or even those of modern date, for satisfactory information respecting the alterations of the blood in gout, for until recently all that had been advanced, though embodying much truth, was purely speculative, and failed to convince the minds of many pathologists who endeavoured to explain the phenomena of the disease by other hypotheses than that of the presence of a morbific matter.

In this chapter it will be my aim to give an account of the present state of our knowledge on this subject, of the highest importance for the right understanding of the pathology of gout, and for the clear explanation of many of the pathognomonic symptoms it exhibits.

If any portion of the body may be considered of paramount importance, it is undoubtedly the blood, for through its agency all the processes of life are carried on;

by its means the different portions of the animal frame are nourished, and it is in itself the centre of the most important changes. Hence the value of a careful study of its composition and properties in the investigation of the nature of any disease.

As the blood receives all the crude nourishment introduced into the system, previously to its becoming a part of the solid framework, and prepares it for its destination; as it is also the receiver of the products of the metamorphoses of the tissues; there will necessarily be found among its constituents; 1st, matters to be prepared and made fit for nutrition; 2nd, many principles already perfected; and 3rd, various effete matters destined for excretion. These latter, in health, exist in the blood only in the most minute traces, owing to the perfection and activity of the excreting organs.

The annexed table, exhibiting the composition of healthy blood in the 1000 parts, will facilitate the clear comprehension of the changes which this fluid undergoes in gout.

Clot.	Globulin 123·5 Hæmatin 7·5	constituting the red corpuscles	131·0
	Fibrin		2·2
Serum sp. gr. 1029 alkaline.	Albumen		70·0
	Salts :— Phosphate of soda, lime, magnesia, and iron Sulphate of potash Chlorides of sodium and potassium, silica, &c.		6·0
	Fats :— Margarine Oleine Seroline Cholesterine Phosphuretted Fats, &c.		1·3
	Unknown substances, called extractive matters, with traces of urea, uric acid, creatine, &c.		5·5
	Water		784·0
	Oxygen Carbonic acid Nitrogen	dissolved in the fluid.	

Do the normal constituents of the blood become altered in gout, or are matters naturally excrementitious retained in the fluid, thereby influencing its composition?

The *globules* or red corpuscles are not necessarily altered; in acute gout they may remain in the normal proportion, but in many chronic and asthenic cases they are notably diminished, as they would be in weakened and depraved conditions of the habit arising from any other cause. In gout occurring in painters, plumbers, and other workers in lead, it is common to find considerable diminution of the globules; this is not simply the effect of gout, but is dependent on the metallic impregnation, for one of the earliest effects of the absorption of lead into the system is to produce anæmia.

The *fibrin* undergoes the same variations as in other inflammatory diseases. When a patient is suffering from considerable local inflammation it is increased in quantity, even to four, five, or six parts in 1000, the augmentation being in proportion to the intensity of the inflammation; but in chronic gout it may remain in its normal proportion, or be only very slightly raised. The variation in the febrin appears, therefore, to have no relation to gout as such, but to depend simply on the development of inflammation from the morbid condition of the habit; it follows, therefore, that the blood when drawn from a gouty patient may exhibit the phenomena of being buffed, or buffed and cupped, or it may present nothing abnormal.

The *serum* is not necessarily altered in physical characters; its specific gravity may remain at the normal figure, and its colour and consistence as in health: still, from the results of an extensive table showing the weight of this fluid in different diseases, I am of opinion that in gouty cases the mean specific gravity is lower than in most other affections; in fact than in all diseases, with the exception of albuminuria and true scorbutus. In cases of acute gout occurring in robust subjects, the blood does not show this phenomenon; in fact it appears only in patients who have suffered from chronic gout, or in cases of well-marked kidney affection. When treating of the condition of the urine in gout, we shall show how common it is to find traces of albumen in the acute, and still more frequently in the chronic, form of the disease, especially when accompanied with visible deposits of urate of soda; the diminution of the specific gravity of the serum depends, therefore, partly upon the loss of albumen by the kidneys. In scarcely any case of uncomplicated gout have I observed the weight of the serum below 1025, and the average in chronic cases has been from 1027 to 1028, only a little lower than in health. I have never found the albumen of the blood increased in gout, although such has been occasionally assumed on mere hypothetical considerations. The variations in amount of the saline matters of the serum have not yet been made a subject of special investigation, a remark which applies equally to the fatty ingredients.

Where, then, shall we look for the morbid changes, seeing the normal constituents are not necessarily modified? It is in the augmentation of those principles which exist in health in such minute traces as to be detected with difficulty, that the peculiar alteration of the blood in this disease is manifested.

A severe case of gout came under my notice in the summer of 1847. The patient was a man about forty-one years of age, who had for the three previous years suffered from repeated fits of this disease, and exhibited several small chalk-stones about the palmar surfaces of his fingers, and a few spots in the ears. At the time of admission into the hospital, he was labouring under a recent acute attack, and many joints in the right hand were inflamed and swollen. From several considerations I was induced to examine his blood, more especially with the object of ascertaining whether uric acid was present; for this purpose a small amount of the fluid was procured. The clot was found to be firm and somewhat buffed: the serum clear, alkaline in reaction, and of specific gravity 1028. Feeling assured that, if uric acid were present, it would be in the serum, 1000 grains of that fluid were dried in a water bath, reduced to powder, and boiled with rectified spirit, for the purpose of removing matters which might interfere with the separation of the uric acid, and after being thus exhausted it was treated with boiling distilled water.

When a few drops of the watery solution were evaporated to dryness with nitric acid, and held over the vapour of ammonia, distinct evidence of uric acid was afforded by the production of the beautiful purple tint of murexide or purpurate of ammonia; and when the solution was reduced to a thin syrupy consistence, and a few drops of hydrochloric acid added, uric acid was deposited in its usual characteristic crystalline form.

From a second quantity of blood drawn soon after the first, 1000 grains of serum were taken and treated in the same manner, except that no hydrochloric acid was added. The concentrated watery solution was allowed to stand for some hours, when very numerous tufts of crystals were found deposited on the sides of the vessel and surface of the fluid. These crystals were proved to consist of urate of soda; they yielded rhombs of uric acid on the addition of hydrochloric acid, and when incinerated left an ash, alkaline in reaction, soluble in water, and not answering to the tests for potash.

These observations were soon afterwards repeated upon several cases of gout with uniform results, and published in the Transactions of the Medico-Chirurgical Society for 1848; and the following conclusion at that time drawn, viz., that "the blood in gout always contains uric acid in the form of urate of soda, which salt can be obtained from it in a crystalline state." From that time I have been in the habit of examining the blood in this disease when opportunity has presented itself, altogether in more than a hundred and fifty cases, and the only alteration I should feel disposed to make in the above would be to append the words, "in abnormal quantities;" as I have found that in health the merest traces both of uric acid and urea can now and then be detected by very great care in manipulation.

The results of several quantitative analyses which I made on the blood of gouty patients, in order to determine the amount of uric acid, are contained in the paper alluded to.

In the case of the man whose history is recorded, and in whose blood uric acid was first discovered, 1000 grains of the serum yielded 0·050 grain of uric acid.

In a second case the same quantity of serum gave 0·025 grain of uric acid.

In a third case 0·030 grain of uric acid was obtained from 1000 grains of serum.

In the blood of a fourth patient 1000 grains of serum yielded as much as 0·175 grain of uric acid.

In another case, the history of which has been detailed in the chapter on chronic gout, 1000 grains of the serum yielded 0·11 grain of uric acid.

In all these determinations, the quantities obtained were probably much under the actual amounts, as considerable loss is liable to occur from unavoidable causes.

The process above described for determining uric acid requires considerable time and care, especially if any attempt be made to estimate the quantity; and hence, although it is a method most desirable to have recourse to in investigating the pathology of gout, yet it is one which cannot be readily employed in clinical medicine. To obviate this difficulty I have devised another mode of ascertaining the presence of uric acid in the blood, which I have been much in the habit of using clinically for many years, and with the results of which I have reason to be well satisfied; it is likewise a method which can be readily employed by any medical practitioner, and which has the advantage of requiring the abstraction of only a minute quantity of blood. I have named the process the "Uric Acid Thread Experiment," and it is thus performed:—Take from one to two fluid-drachms of the serum of blood, and put it into a flattened glass dish or capsule; those I prefer are about three inches in diameter, and one-third of an inch in depth, which can be readily procured at any glass-house; to this add ordinary strong acetic acid, in the proportion of six minims to each fluid-drachm of serum, which causes the evolution of a few bubbles of gas. When the fluids are well mixed, introduce one or two ultimate fibres, about an inch in length, from a piece of unwashed huckaback or other linen fabric, which should be depressed by means of a small rod, as a probe or point of a pencil. The glass should then be put aside in a cool place, until the serum is quite set and almost dry; the mantelpiece in a room of the ordinary tempertaure, or a book-case, answers very well, the time varying from thirty-six to sixty hours, depending on the warmth and dryness of the atmosphere.

Should uric acid be present in the serum in quantities above a certain small amount noticed below, it will crystallise, and during its crystallisation will be attracted to the thread, and assume forms not unlike that presented by sugar-candy upon a string, as shown in Plate V. fig. 5, *a*, *b*, *c*; when in the dark field under polarised light it has an appearance represented in the wood-cut, fig. 6. To observe this, the glass containing the dried serum should be placed under a linear magnifying power of about fifty or sixty, procured with an inch object-glass and low eye-piece, or a single lens of one-sixth of an inch focus answers perfectly. The uric acid is found in the form of rhombs, the size of the crystals varying with the rapidity with which the drying of the serum has been effected, and the quantity of uric acid in the blood. To ensure perfect success, several precautions are necessary.

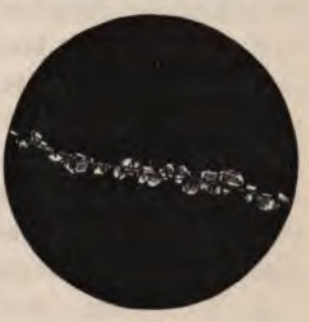

Fig. 6.*

1. The glasses should be broad and flat; watch-glasses of the ordinary kind are not suitable, being too small, allowing the fluid to be frequently spilt; and also too much curved, causing the film of partially dried serum to curl up and split.

2. The acetic acid should be neither very strong nor too weak. The glacial acid forms a gelatinous compound with the albumen of the serum, producing flakes; and very weak acid adds unnecessarily to the bulk of the fluid. By experience, I find the ordinary Pharmacopœia acetic acid well suited for the experiment.

3. The character and quality of the thread are of some moment. Very smooth substances, as hairs or fine wire,

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* Fig. 6 represents a fibre of thread with rhombs of uric acid adhering to it, as seen under polarised light with a linear magnifying power of 60, formed with an inch object-glass and low eye-piece.

but imperfectly attract the crystals; if the number or length of the fibres be too great, and the amount of uric acid small, the crystals become much scattered, and therefore but few appear in the field of the microscope. The glass should not be disturbed during the drying of the serum, or the crystals may become detached from the thread.

4. Some attention to temperature is necessary; if the serum be evaporated at a high temperature, above 75° F.: for example, the process of drying may take place too rapidly to allow crystallisation; the temperature of an ordinary sitting-room answers well for the purpose; the glass should be protected from dust.

5. If the serum be allowed to dry too much before the examination takes place, the surface becomes covered with a white efflorescence consisting of feathery phosphates, which may obscure the thread; they can be removed by the addition of a few drops of water before placing the glass under the microscope; sometimes overdrying causes the film to become cracked or fissured throughout, as well as covered with the phosphatic efflorescence.

6. It is well, when practicable, to put up two or more glasses with the same serum.

7. The blood should be recently drawn, or at least no change should be allowed to take place in it before the experiment is made, as uric acid, when in contact with albuminous principles, is liable rapidly to undergo decomposition.

Degree of Delicacy of the above Test for Uric Acid.— The serum of healthy blood, as also in the majority of diseases which have been studied, although usually containing a trace of uric acid, gives no indication of its presence by the "uric acid thread experiment;" and the absence of extreme delicacy in this test is a most valuable property.

I have endeavoured to ascertain, by a series of experiments, the quantities of uric acid which must exist in blood before its presence can be thus demonstrated,[*] and for this purpose have added urate of soda, in certain definite proportions, to the serum of blood taken from a healthy subject.

1. Serum, with the addition of uric acid in the proportion of 0·010 grain in the 1000 grains	gave no indication of uric acid.
2. Serum, containing 0·020 grain in the 1000 grains	no crystals of uric acid deposited.
3. Serum, containing 0·025 grain in the 1000 grains	gave two or three crystals on thread.
4. Serum, containing 0·030 grain in the 1000 grains	gave a few crystals.
5. Serum, containing 0·040 grain in the 1000 grains	gave several crystals.
6. Serum, containing 0·050 grain in the 1000 grains	a moderate sprinkling of crystals on the thread.
7. Serum, containing 0·060 grain in the 1000 grains	the thread pretty freely covered with crystals.
8. Serum, containing 0·080 grain in the 1000 grains	very numerous crystals on thread.
9. Serum, containing 0·100 grain in the 1000 grains	abundance of crystals, more than usually found in serum.
10. Serum, containing 0·200 grain in the 1000 grains	thread completely covered with uric acid, and numerous crystals scattered throughout serum.

From this it appears, that an amount of uric acid equal to at least 0·025 grain in the 1000 grains of serum, in addition to the trace existing in health, is required before the "thread experiment" gives indication of its presence, and hence the appearance of uric acid on the thread is complete evidence of an abnormal quantity in the blood. In several experiments on the blood in gout and albuminuria, when quantitative determinations were made, the amount of uric acid in the 1000 grains of serum was found to vary from 0·045 to 0·175 grain.

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[*] Medico-Chirurgical Transactions, vol. xxxvii.

Changes in the Uric Acid during decomposition of the Serum.—When enumerating the precautions which should be observed in the employment of the thread test, it was stated that recently drawn blood should be made use of; the importance of this precaution will be seen from the following observations, which were at first the cause of some perplexity. Having ascertained the presence of uric acid in the blood in several cases, and put aside the serum, I found, on repeating the experiment, that no indication of uric acid could be discovered; this happened most frequently during the summer months. On closer examination I ascertained that the serum had undergone slight decomposition; this gave me a clue to the explanation of the phenomenon, namely, that the uric acid in the blood undergoes a species of fermentation, and is decomposed whenever the albuminous portion becomes altered. In order to verify this, the following experiment was made and repeated several times with uniform result.

Urate of soda was dissolved in serum in the proportion of from 0·10 grain to 0·30 grain to the 1000 grains, and the fluid allowed to become putrid, small portions being put into the glasses from time to time; it was found that the crystals, although very numerous at first, became fewer in number, and soon disappeared altogether, proving the uric acid to have been gradually destroyed, and thus showing the extreme importance of using fresh serum, more especially in warm weather.

I have made some experiments in order to discover the changes which uric acid undergoes when subjected to such decomposition.

It is a well-known fact that when exposed to the action of certain oxidising agents, as the puce-coloured oxide of lead, uric acid is broken up into oxalic acid, urea, and allantoin, and when the oxide is in excess the oxalic acid is further oxidised and converted into carbonic acid; this fact led me to try whether oxalic acid may not be formed in the blood from a change in the uric acid. For this purpose I made daily observations on serum rich in uric acid, and had evidence, during its decomposition, of the formation of oxalic acid, the occurrence of octahedral crystals of oxalate of lime. I have also evaporated the serum when decomposition was taking place, and obtained crystals of oxalate of lime. To make the experiment more conclusive, I have taken serum of blood containing no appreciable amount of uric acid, and dividing it into two parts, to one have added urate of soda, and then allowed both to decompose; it was found that in the serum to which the urate had been added, octahedral crystals of oxalate of lime were formed, but not in that free from uric acid. The microscopic examinations were made with amplifying powers of 200 to 400 linear. Much further investigation into this subject is required, but enough has been done to show that the study of these changes is not without interest to the pathologist, for there can be little doubt that oxalic acid is formed in the animal body, not, as formerly supposed, from the oxidation of saccharine matters, but from the decomposition of uric acid.

As before stated, I have made numerous examinations of the blood in cases of gout; in the subjoined Table some account of forty-seven of these will be found, and a perusal of them cannot fail to convince the reader that the articular affection under which the patients suffered was truly characteristic of the disease. Since the Table was constructed, I have had numerous opportunities of confirming the results therein contained, but those already tabulated are quite sufficient to prove my original statement, that *the blood in gout is invariably rich in uric acid.*

TABLE, *Exhibiting the History and Symptoms of* 47 *present in the Blood.*

Name.	Age.	Occupation.	Habits of Life.	Hereditary Predisposition.	General state of Health.	No. of attacks.
W. F.	38	Gasfitter, occasionally musician. Has never had lead colic.	Drank much gin and beer or porter.	Father had gout or rheumatism. Mother's father gout, and all mother's brothers. Also own brother. (See below.)	Pretty good. Fractured ribs about six years ago; since then affected with present disease.	Numerous. Four or five well marked.
F. P.	43	Painter (House).	Drank freely, porter and gin. Not in great excess; often six pints of porter daily.	Apparently hereditary from father, who, however, died when patient was young.	Good, except when suffering from gout or lead colic.	Numerous. First attack eleven years since, first in ankle, next in great toe.
J. E.	64	Stonemason.	Not stated.	Not stated.	Good.	Numerous. First attack occurred twenty years since in some part of foot.
W. F.	40	Wine-cooper.	Has drunk freely of beer and gin.	Father and grandfather on same side had gout, and father had chalkstones.	Pretty good.	Numerous. First about ten years since, in feet and ankles.
C. F.	38	Brewer's Man.	Has drunk very freely, chiefly porter; some gin.	Father's brother had gout.	Good in general.	Not known; numerous. About ten years since had first attack, confined to foot.
C. F.	35	Painter.	Temperate; about two	See under W.F., case 1,	Pretty good, except from	Second attack. First,

Cases of Articular Affection, in which Uric Acid was Cases of genuine Gout.

Cause of.	Symptoms during Attack.	State of Blood.
Much drinking before present attack.	Commenced in ball of left great toe; after four or five days, knees, elbows, hands, fingers, and left ankle, also left metacarpal and phalangeal joints affected. Pitting on pressure. Pulse 92, hard and full; tongue slightly furred; some thirst; deposits of urate of soda on palmar surface of left index finger. Not on ears.	Clot firm; serum alkaline; sp. gr. 1029·4 at 68° F.; much uric acid by thread experiments.
None assigned for the present.	Commenced in left knee, then dorsum of left hand, right hand, and both feet and ankles, small joints of hands. Pitting on pressure. Pulse 92, rather hard; tongue slightly furred; appetite pretty good. Deposits in both ears. No other deposits seen. No permanent mischief to joints.	Clot slightly buffed and contracted; serum alkaline; sp. gr. 1028·0 at 60° F.; abundance of uric acid. *Blister fluid* from inflamed joint; no trace of uric acid. *Blister fluid* from abdomen gave a moderate amount of uric acid.
Not stated.	Affection of hands, ankles, knees, hips. Pulse 80. Deposits in ears; and little nodules in integuments near eyes.	Uric acid in serum.
Patient has often brought on attacks by the use of port wine.	Commenced in knee, then elbow, and small joints of hands. Pitting on pressure. Pulse 76. No deposits of urate of soda noticed.	Serum contained a considerable quantity of uric acid.
None assigned.	Both feet, knees, hips, small joints of hands, and in great toe. Pitting on pressure. Pulse 80. No thirst. Minute concretions of urate of soda in left ear. Large semi-fluid collection in left foot of creamy urate of soda; some deposit also on right little finger.	Clot firm, buffed and cupped; serum alkaline; sp. gr. 1029·0 at 55° F.; abundance of uric acid. *Blister fluid* from inflamed part gave no trace of uric acid. *Blister fluid* from ankle, a few crystals of uric acid.
Injury. Struck by	Commenced two days after injury, in left elbow and fingers; after-	Clot normal; serum alkaline; sp. gr. 1026·8

Name.	Age.	Occupation.	Habits of Life.	Hereditary Predisposition.	General state of Health.	No. of attacks.
			pints of porter daily; formerly took spirits also.	the brother of the present patient.	present disease.	one year and a quarter since, commenced in left foot.
T. B.	54	Farrier.	Has always been a free drinker of beer and gin.	Father had gout, also one brother.	Good.	Has had numerous attacks. First in feet, seven or eight years since; does not remember whether the great toe was chiefly affected; great toes have been in some attacks.
J. H.	45	Publican for many years, formerly a post boy.	Intemperate. Drank much beer and gin. Good diet.	Father had gout, also brothers.	Good, except gouty.	Numerous. First about fourteen years since, in right great toe.
S. N.	68	Wheelwright.	Regular.	Not known. (Patient very deaf indeed).	Pretty good.	About the twelfth. First attack in ball of left great toe, next in right great toe, afterwards in large joints also.
J. Z. R.	48	Stableman, formerly a soldier.	Lived freely, both in eating and drinking.	None.	Good.	About third attack. Twenty years since, swelling of ball of great toe; next attack commenced also in great toe.

Cause of.	Symptoms during Attack.	State of Blood.
a shaft; and fracture of ribs and pleuritis.	wards both feet and right knee, and right index finger. Pitting on pressure. Pulse 108. Tongue furred; thirst. Fluid from right index finger (middle joint) obtained by puncture, milky from urate of soda (four days after it was inflamed): concretions afterwards appeared on right ear, and in left middle finger.	at 50° F.; abundance of uric acid. *Blister fluid* from chest, a moderate amount of uric acid.
Injury from the kick of a horse, on chest.	About forty-eight hours after injury the dorsum of right hand and foot, and left elbow, upon which he fell, became affected. Pitting on pressure. Pulse 80, full, hard; some thirst; appetite good. No deposits of urates.	Clot slightly buffed; serum alkaline; sp. gr. 1026·64 at 58° F. A good sprinkling of uric acid on thread.
Drink.	Ankles and feet chiefly affected. Pitting freely on pressure. One knee also much swollen; tongue clean; appetite good; no thirst. Pulse 76, not resisting. Nodules of urate of soda on both ears.	Clot normal; serum alkaline; sp. gr. 1029·6 at 47° F. Abundance of uric acid by thread experiment.
Not given.	Great toes both affected; left knee slightly; patient has eczema of both legs. Pulse 92. Appetite good. No deposits of urate of soda.	Clot normal; serum alkaline; sp. gr. 1026·0 at 65° F. Considerable sprinkling of uric acid on thread.
Not assigned.	Commenced in right knee, then hip, shoulders, hands, left knee, balls of both great toes became implicated. Pulse 110, rather hard; tongue white, furred. Pitting on pressure. No deposits of urate of soda on any part of body.	Clot normal; serum alkaline; sp. gr. 1028·0 at 60° F. A few crystals of uric acid. *Blister fluid* gave crystals of uric acid. *Blister fluid* from inflamed knee, no crystals of uric acid. Second bleeding two days after: Clot not

Name.	Age.	Occupation.	Habits of Life.	Hereditary Predisposition.	General state of Health.	No. of attacks.
G. H.	56	Traveller.	Temperate, but has drunk much porter, half a gallon or more per diem.	Not known.	Good.	About sixth attack. First confined to right great toe, ten years since. Other joints afterwards affected.
G. H.	52	Cab-driver and proprietor.		No gout or rheumatism from father or mother; but uncles and aunts on both sides subject to gout.	Good, except gout.	Numerous. First attack thirty years ago, in feet; second attack in ball of both great toes. Knees not affected until two years since; and last year upper extremities.
J. S.	61	Pianoforte maker.	Lived well; drank moderately of beer and some gin.	None.	Good, except occasional gout, and latterly some albuminuria.	First attack of gout about twenty years since.
C. H.	46	Coachman. Last three years a cabman.	Has drunk freely of beer and gin.	None.	Good, except subject to attacks like the present.	Numerous. First attack about twenty years since in right great toe

Cause of.	Symptoms during Attacks.	State of Blood.
		buffed, or cupped; serum alkaline; sp. gr. 1027·1 at 65° F. Pretty good quantity of uric acid. Third bleeding eight days after: Clot firm; fibrinous coat; serum gave a moderate amount of uric acid by uric acid thread experiment.
Was exposed much to cold before present attack.	Commenced in right foot, then left foot, right knee, and hand; left shoulder and hand. Pitting on pressure. Pulse 108, hard; tongue white, furred. No deposits of urates.	Serum gave abundance of uric acid.
None assigned.	Affection of left elbow, wrist, and metacarpal joint of index finger. No deposits of urates. Pulse 86; tongue furred; no appetite. Pitting on pressure.	Clot buffed, firm; serum alkaline; sp. gr. 1025·56 at 64° F. Pretty good sprinkling of uric acid by thread experiment.
Present attack came on after some chest affection.	First examination of blood some little time before the joints became affected. Patient then suffering from chest symptoms and slight œdema. Second examination after attack had completely passed off. During attack the right great toe and knee were affected. Pitting on pressure. Had albuminuria, gradually lessening to a mere trace.	First examination: Clot normal; serum alkaline; sp. gr. 1021·6 at 66° F. A good quantity of uric acid; thread studded with crystals. Second examination: Clot normal; serum alkaline; sp. gr. 1022·4 at 66° F. A very few crystals of uric acid.
None assigned.	Commenced thirteen weeks before admission, then partially recovered; for three weeks has kept his bed. Hands, knuckles, knees, feet, and shoulders affected. Pulse 72, full,	First examination: Clot firm, buffed; serum; sp. gr. 1026·0 at 66° F. No uric acid found by thread experiment.

Name.	Age.	Occupation.	Habits of Life.	Hereditary Predisposition.	General state of Health.	No. of attacks.
						and instep only. Second attack, sixteen years since, in same part. Third, twelve years since in left great toe. In subsequent attacks knees and elbows. Attacks gradually increasing in frequency.
J. B.	60	Excavator.	Drinks freely.	None.	Good.	Fourth attack. The first commenced in right great toe.
F. W.	47	Gentleman's servant.	Lived pretty freely. Drank beer chiefly.	None clearly discoverable.	Pretty good, except from gout.	Numerous. Early attacks commenced in great toe.
J. Q.	58	Has been for a long time a brewer's drayman.	Drank very freely of beer and gin.	None distinctly discoverable.	Pretty good until the last few years.	Numerous.
M.C.	60	Tradesman.	Drank freely, beer, &c.	Not known.	Good, until gout appeared.	Very numerous indeed.
T. M. April, 1854.	53	Cook.	Eats freely of meat; has drunk pretty freely of beer.	None known.	Good except when gouty.	Almost innumerable. First commenced in

Cause of.	Symptoms during Attack.	State of Blood.
	hard. No deposits of urate of soda. The first examination of the blood was made during febrile disturbance of the system; the second when the patient had pain in joints, but no fever.	Second examination. Clot normal; serum alkaline; sp. gr. 1024·8 at 65° F. A moderate amount of uric acid.
Appears to have had attacks every one or two years.	Dorsum of left wrist, hand, metacarpal and several phalangeal joints, swollen and somewhat hot. Pitting of parts on pressure. Pulse 72. No deposits of urate of soda in any part of the body.	Clot buffed, firm; serum clear, alkaline; uric acid thread experiment gave abundance of uric acid.
Cold. Taking hard beer.	Pains of fingers, wrist, elbow, and shoulder of left side; then same on right side; left great toe, right knee. Pulse 104, rather full and sharp. Some thirst, moderate appetite. Pitting on pressure. Desquamation of cuticle. No deposits of urate of soda.	Serum gave by uric acid thread experiment uric acid on thread; serum of blood from loins by cupping gave also the same.
Drink brings on an attack.	Left hand and arm, and knees, slightly affected. Pulse 80. Pitting on pressure. Several small deposits of urate of soda in ears; and much distortion of small joints of feet and hands.	Clot not buffed; serum clear, alkaline; sp. gr. 1027·5 at 54° F.; uric acid thread experiment gave much uric acid on thread. About 0·07 grain collected by analysis from 1000 grains of serum.
The present attack seemed to be brought on by mental anxiety.	Present attack chiefly in head; delirium, heat of head, &c. Many of the smaller joints of feet and hands much distorted. No distinct deposits of urates.	Blood by cupping from loins; clot firm; serum clear; sp. gr. 1029·2 at 70° F.; uric acid thread experiment gave abundance of uric acid.
None assigned for any one attack.	This patient has had at different times all the joints of the body acutely inflamed, sometimes the larger, sometimes the smaller, chiefly affected in	Clot buffed, and slightly cupped; serum clear, alkaline; sp. gr. 1027·12 at 60° F. By

Name.	Age.	Occupation.	Habits of Life.	Hereditary Predisposition.	General state of Health.	No. of attacks.
			Not intemperate.			right great toe about twenty years since. For some time the disease attacked great toes only.
Idem. Feb. 1850.						
Idem. Nov. 1849.						
G. R.	31	Cabman for many years.	Drinks freely of beer, some spirits.	None.	Good before present affection.	About six; has had joint affection without fever.
W. M.	52	Printer.	Before having gout, drank rather freely of gin, some beer; lived well.	None known; but one younger brother has gout.	Good until fourteen years since.	Very numerous. First attack in right great toe, about twelve years since. Second attack a year after, in great toe also. Upper extremities have not been affected for more than six years, nor concretions visible more than three years.

Cause of.	Symptoms during Attack.	State of Blood.
	the attack. There is always much pitting on pressure. The pulse during acute attacks becomes quick and hard. Nodules of urate of soda on both ears; and chalk stones on many parts of body, both upper and lower extremities. Sometimes discharges of this urate, and formation of abscesses take place.	uric acid thread experiment a considerable amount of uric acid was obtained.
		Blood by cupping from loins; serum clear, alkaline; sp. gr. 1026·0 at 53° F. Uric acid thread experiment gave abundance of uric acid.
		Clot firm and large; serum clear, alkaline; sp. gr. 1029·1 at 50° F. By uric acid thread experiment an abundance of uric acid; from 1000 grains 0·04 grain collected.
	No swelling of joints. Symptoms subjective only. Appetite good. No thirst. Pulse 70. Complains of pains in joints, and stiffness in walking, which he has had several months.	Clot not buffed, not very firm; serum alkaline; sp. gr. 1027·4 at 63° F. A moderate amount of uric acid.
Not assigned for any one attack.	At various times, different joints affected, sometimes nearly all together. Great toes, and smaller joints of fingers, as well as large joints. Patient covered with concretions of urate of soda; many in ears; much crippled.	March, 1853.—Acute attack; clot cupped and buffed; serum alkaline; sp. gr. 1026·4 at 51° F. Abundance of uric acid, shown by uric acid thread experiment. *Blister fluid* gave uric acid. Vomited matters produced by colchicum gave no uric acid.
		July, 1852.—Acute attack; clot firm, buffed; serum alkaline; sp. gr. 1026·0. Gave uric acid in abundance on thread.
		Jan. 1851.—Acute attack. Abundance of uric acid in blood.

Name.	Age.	Occupation.	Habits of Life.	Hereditary Predisposition.	General state of Health.	No. of attacks.
H. U.	50	Painter.	Irregular.	None known.	Good until he had painters' colic.	Numerous. First attack about three or four years since in feet.
J. T.	42	Ginger-beer maker.	Takes beer freely, sometimes a little gin, but not intemperate.	None.	Pretty good, except gout.	Numerous. First attack about ten years since; very frequent within last five years. Not noticed in history which joint was affected in first attack.
W. B.	52	Coachman in gentlemen's families for many years.	Drank pretty freely at one time, chiefly wine.	None known.	Good, until first attack of gout.	Very numerous, had suffered for many years. Came on first in great toe.
T. M.	41	Porter; formerly in the army.	Regular.	None.	Pretty good; had some injury from poisoned wound, a few years since.	Third attack.
W. R.	32	House painter.	Diet good; not intemperate, but drinks beer.	Father had gout, brother suffers also from gout.	Repeatedly had lead colic. Gout for six or seven years; commenced in ball of great toe.	Numerous. For seven months has not been free from gout.

Cause of.	Symptoms during Attack.	State of Blood.
Attack clearly induced by drink.	Present attack chiefly affects joints of hands; but knees and feet stiff and painful. Concretions in ears and around some joints.	Blood serum contains abundance of uric acid.
A glass of rum will induce an attack. Over fatigue appeared to have brought on the present.	Commenced in hands; then knees, ankles, &c., became affected. Deposits of urate of soda in ears only.	Clot large and firm, buffed; serum alkaline; sp. gr. 1027·2 at 60° F. 1000 grs. of serum gave 0·044 grain of uric acid.
Any depressing cause, or drink, will induce a fresh attack.	Scarcely ever free from some acute affection in one or more joints. Concretions in hands, feet, elbows, &c., and ears. Gouty abscesses, generally discharging more or less creamy urate of soda.	Clot normal; serum alkaline; sp. gr. 1030·0 at 60° F. 1000 grains of serum gave of uric acid 0·11 grain.
Not known.	Commenced at midnight, in the ball of left great toe. Pulse 100, rather hard. Tongue furred. Appetite pretty good. Afterwards desquamation of skin over ball of toe. No deposits of urates on any part of body.	Clot normal; serum alkaline; sp. gr. 1026·0 at 70° F. Abundance of uric acid by thread experiment. Second bleeding, attack passed off; clot normal; serum alkaline; sp. gr. 1024·0 at 53° F. A few crystals of uric acid. After leaving hospital, clot normal; serum pale; sp. gr. 1027 at 60° F. A few crystals of uric acid.
Subject to exposure to cold.	Right foot, great toe, both ankles, knees, right wrist, middle finger of left hand inflamed. Tongue clean. No thirst. Appetite good. Pulse 95. Much pitting of swollen joints. No deposits visible on any part of body. No distortion of joints.	Clot rather cupped; serum alkaline; sp. gr. 1028·0 at 41° F. Abundance of uric acid by thread experiment. *Blister serum*, on partial recovery, yielded a moderate amount of uric acid. Second bleeding, clot normal. A moderate amount of uric acid in blood.

Name.	Age.	Occupation.	Habits of Life.	Hereditary Predisposition.	General state of Health.	No. of attacks.
W. B.	46	Coal porter.	Good living; a considerable amount of porter per diem.	Father affected with gout.	Good.	First attack. The next about three weeks after. Second attack.
J. D.	27	Farrier.	Regular. Diet good; takes a considerable quantity of beer, and some gin.	None.	Good.	First attack.
J. C.	30	House painter for ten years, before a plumber.	Irregular; has drunk much porter and spirits.	One grandfather and father subject to gout.	Not good, from frequent syphilitic affections gout and painters' colic.	Ninth or tenth attack. First commenced in great toe.
B. F.	38	Bricklayer.	Pretty regular but drinks freely of gin and beer.	None.	Good.	Fifth or sixth. First, two years since, commenced in great toe.
H. C.	51	Grocer.	Regular.	Not known. Not noticed in case books.	Suffers from bronchitis and emphysema, and from occasional attacks of gout.	Numerous.

Cause of.	Symptoms during Attacks.	State of Blood.
Much night work lately.	Commenced at night in ball of left great toe, then outer side of ankle. Considerable pitting on pressure. Pulse slow. Appetite pretty good. No deposits of urates.	Serum gave much uric acid by thread experiment. Clot normal; serum, sp. gr. 1028·6 at 52° F.
Much exposed to cold.	Same parts affected as before, and right great toe in addition.	Serum of blood gave much uric acid by thread experiment.
Exposed to changes of temperature at work.	Commenced in right ankle, then left wrist, right knee, and right wrist; same affection of ball of right great toe. Pulse 64. No pitting noticed in notes. No deposits on any part of body. Joint affection *immediately* cured when colchicum was administered. Prior treatment gave no relief.	Clot normal; serum alkaline; sp. gr. 1027·6 at 55° F. Abundance of uric acid. *Blister fluid* clear, no coagula. No uric acid. Small quantity only procured, and that from an inflamed joint.
Attacks brought on distinctly by drink.	Toes, ankles, fingers, and wrists. Desquamation of cuticle. Pitting on pressure. Pulse 66. Appetite bad. Blue line on gums. A small deposit of urate of soda in left ear; some distortion of joints.	Clot buffed, not cupped; serum alkaline; sp. gr. 1026.4 at 49° F. Abundance of uric acid by uric acid thread experiment.
Patient thinks exposure to wet and cold.	Commenced in left knee and foot, then right great toe, afterwards both hands, especially index finger of left. Pitting on pressure, and desquamation of cuticle. Pulse 96, sharp. Appetite good. No deposits of urates on any part of body.	Serum clear; sp. gr. 1027. Abundance of uric acid by thread experiment.
After an attack of bronchitis, which it greatly relieved.	Commenced in ball of left great toe, afterwards left knee. Pitting on pressure. Pulse 108, sharp. No deposits of urates on any part of body. At the time of second bleeding, patient suffered from dyspeptic symptoms.	Clot normal; serum alkaline; sp. gr. 1029·2 at 52° F. Thread well sprinkled with uric acid. A former bleeding also gave much uric acid just before joint affection appeared.

FEMALES.

Name.	Age.	Occupation.	Habits of Life.	Hereditary Predisposition.	General State of Health.	No. of Attacks.
E. W.	51	Laundress; a widow.	Regular.	Father had some joint affection in knees and feet. One brother also, with white deposits and crippled limbs.	Good, till within last ten years.	Numerous. First attack about ten years since; knees were affected. Another attack some months afterwards.
M. J.	53	Servant.	Regular, but has lived rather hard at times.	Mother had gout and chalk stones.	Not very good. Phthisical. Died a few months afterwards from chest disease.	First attack.

FEMALES.

Cause of.	Symptoms during Attack.	State of Blood.
None assigned.	Commenced in knees, then ankles, elbows, wrists, and fingers. Pulse 92, rather hard. No deposits of urate of soda.	Clot firm, buffed; serum alkaline; sp. gr. 1028·0 at 65° F. A considerable amount of uric acid by thread experiments.
	Affecting the left index finger first, then wrist and shoulders, chiefly small joints of right hand; left knee and instep. Desquamation of cuticle. No deposits of urate of soda.	Clot firm, slightly buffed; serum alkaline; sp. gr. 1029·2 at 46° F. Much uric acid by uric acid thread experiment. Abundance of uric acid found in *serum from blister*, by uric acid thread experiment.
Not assigned.	Commenced about six weeks ago in ball of both great toes, afterwards went to knee; when bled the joint disease was not at all intense. The inflamed parts pitted on pressure. No concretions of urate of soda.	Clot cupped and buffed; serum alkaline; sp. gr. 1026·8 at 60° F. A moderate amount (small) of uric acid. *Blister serum* alkaline; sp. gr. 1024·0 at 65° F. A few crystals of uric acid. Second bleeding, clot buffed and cupped; serum alkaline; sp. gr. 1027·8 at 62° F. A pretty good sprinkling of uric acid on thread.

Cases of which the minute details were less known.

Name.	Sex.	Account of Patient.	State of Blood.
C. B.	M.	Attack present about three weeks. Undoubted gouty patient. No concretions noticed.	Serum alkaline; sp. gr. 1031·0 at 60° F. 1000 grains gave of uric acid 0·05 grain.
W. M.	M.	Acute attack. Chronic disease of long standing. Always relieved by colchicum. Concretions in ears and joints.	Clot firm, not buffed; serum alkaline; sp. gr. 1027·8 at 66° F. 1000 grains gave of uric acid 0·062 grain.
U. N.	M.	A patient with gout of great toe and foot.	Serum alkaline; sp. gr. 1031·5 at 60° F. 1000 grains gave of uric acid 0·044 grain.
J. N.	M.	Patient with great toe gout.	A small quantity of blood taken. Gave abundance of crystals of uric acid.
T. P.	M.	A painter (wrists and hands affected), gout for ten years. Last attack one year since.	Serum alkaline; 1000 grains gave of uric acid 0·05 grain.
T. H.	M.	Gout. Attack now in right hand. Several deposits of urate of soda in both ears. Œdema of inflamed parts.	Clot firm, buffed; serum alkaline; sp. gr. 1028·2 at 70° F. Abundance of uric acid.
M. H.	M.	Patient diagnosed to have gout by a physician.	Clot firm, buffed; serum alkaline. Gave much uric acid by uric acid thread experiment.
J. H.	M.	Gout for many years. Large joints now chiefly affected. Has had great toe affection. Deposits in both ears; but not elsewhere noticed.	Serum of blood contained much uric acid.
C. H.	M.	A patient who has suffered many years from undoubted gouty attacks, bled on account of retrocedence of the affection.	Serum alkaline; sp. gr. 1030·1 at 45° F. Gave much uric acid by uric acid thread experiment.
E. P.	M.	Disease diagnosed as true gout by a physician. Attack disappearing rapidly.	Serum gave uric acid crystals on thread. Not numerous.

Name.	Sex.	Account of Patient.	State of Blood.
D. P.	M.	Acute attack of gout; the first attack, in great toe for some days.	Serum alkaline; gave on thread abundance of uric acid.
C. S.	M.	Chronic gout. Great toe often alone affected. No deposits of urate of soda seen.	Blister serum gave uric acid by the thread experiment.
J. S.	M.	Painter. Gout of great toe, of two days' duration. Admitted for epileptic fits.	Clot firm, buffed; serum alkaline; sp. gr. 1028·0 at 65° F. Abundance of uric acid by thread experiment.
T. P.	M.	Gout, with many concretions in ears, and around joints. Died from fracture of femur.	Blood taken after death. Serum by uric acid thread experiment gave much uric acid.

Discovery of Uric Acid in the fluid artificially effused by the application of blistering agents.—Some years since an opportunity occurred which enabled me to show that where morbid effusions take place in patients, whose blood is rich in uric acid, these likewise contain it; this fact was proved as regards the fluid from the pericardium and peritoneum,* but such knowledge could not be made available for any practical purpose. It frequently happens that, for the sake of diagnosis, it is desirable to ascertain the condition of the blood, as to the presence or absence of uric acid, in cases where, from the state of the patient or other causes, venesection cannot well be employed, and it occurred to me that probably the fluid *artificially* effused by the application of a blister would contain this acid, if the circulating fluid were impregnated with it; experience proved the truth of this conjecture. The following are some of the results obtained by the use of the thread experiment, a test which may be employed for the discovery of uric acid in blister as well as in blood serum.

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* Medico-Chirurgical Transactions, vol. xxxvii. 1854.

Dr. Charcot has found, by the thread experiment, distinct evidence of uric acid in the sub-arachnoid fluid from a woman with chronic gout, who died in the Salpêtrière at Paris.

E. W. Feb. 9, 1853.	Serum of blood ; sp. gr. 1029·2 at 46° Fahr. Abundance of uric acid on thread.	E. W. Feb. 11.	Serum of blister. Abundance of uric acid.
J. W. March 5.	Serum of blood ; sp. gr. 1026·4 at 51° Fahr. Abundance of uric acid.	J. W. March 6.	Serum of blister. Abundance of uric acid.
— R. March 25.	Serum of blood ; sp. gr. 1028 at 41° Fahr. Abundance of uric acid.	J. W. March 28. Attack passing off.	Serum of blister ; sp. gr. 1022·8 at 46° Fahr. Crystals of uric acid.
J. H. March 29.	Serum of blood ; sp. gr. 1029·6 at 47° Fahr. Abundance of uric acid.	J. H. April 1.	Serum of blister ; sp. gr. 1024·8 at 54° Fahr. Abundance of uric acid.
C. S. June 30.	No blood taken.	C. S. June 30.	Serum of blister. Numerous crystals of uric acid.
M. J. Nov. 8.	Serum of blood ; sp. gr. 1026·8 at 62° Fahr. Crystals of uric acid not very numerous.	M. J. Nov. 11.	Serum of blister ; sp. gr. 1024 at 65° Fahr. Crystals of uric acid, several in number.
C. F. Jan. 2, 1854.	Serum of blood ; sp. gr. 1026·8 at 50° Fahr. Abundance of uric acid.	C. F. Jan. 13.	Serum of blister ; moderate amount of uric acid.

It appears from the above observations that the fluid effused by the action of a blistering agent applied to the skin, will give evidence of the presence of uric acid when the blood from the same patient exhibits the phenomenon. In the performance of the thread experiment the same precautions must be adopted as for blood-serum ; but, in addition, the application of the blister to an inflamed surface should be avoided, as the existence of inflammation, at least of a gouty character, has the power of destroying the uric acid, and preventing its appearance in the serum ;* this fact is proved by the subjoined observations.

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* The slight inflammation produced by a blister does not appear to destroy much of the uric acid.

C. F. Jan. 2. 1854.	Serum of blood. Abundance of uric acid.	C. F. Jan. 2.	Serum from blister on the dorsum of the hand inflamed with gout. No trace of uric acid.
F. P. Jan. 15, 1854.	Serum of blood. Abundance of uric acid.	F. P.	Serum from blister on inflamed (gouty) knee. No trace of uric acid.
C. C. F. Dec. 21, 1853.	Serum of blood. Abundance of uric acid.	C. C. F. Dec. 23.	Serum from blister on inflamed (gouty) knee. No trace of uric acid.

During the crystallisation of uric acid in artificially effused fluids, a form somewhat differing from that which occurs in blood-serum is apt to be assumed, as the crystals have a greater tendency to agglutinate and form irregular masses.

Should further inquiries confirm the conclusion to which the above limited number of observations point, that during the existence of gouty inflammation there is a gradual destruction of the uric acid in the blood—and other independent researches which I have made appear to favour this idea—it will throw no small light on the pathology of gout, and explain the reason of the improvement in the general health which frequently follows a severe and prolonged fit of the malady.

Urea in the Blood in cases of gout.—In the Medico-Chirurgical Transactions for 1848, I gave the result of some investigations made on the blood in gout in reference to its containing urea, and came to the conclusion that this principle is sometimes present in excess, although not in quantities at all equal to what is found in albuminuria; at the same time it was suggested that the urea being retained in small amounts might explain one of the symptoms of gouty inflammation, namely, the frequent presence of slight œdema; since this period I have made further observations, all confirming my original statement. Dr. William Budd, in a paper published in the same Transactions in 1855, confirmed my observations, though he ascribed the presence of urea to the decomposition of uric acid, and not to any defect in the kidneys; but such an explanation is totally insufficient to account for the accumulation, provided the function of the renal organs remains intact. Dr. Budd gives details of two cases, and mentions that he has detected urea either in the blood or blister serum of seven other persons suffering from acute gout, in none of which was albumen found in the urine, nor was there any other indication of the presence of renal disease. It will be seen, however, further on, that a trace of albumen is frequently present in the urine during the height of a gouty paroxysm, though not discoverable at any other period.

We may conclude from these observations, that urea is often contained in abnormal quantities in the blood in gout; whether it is so in the very early attacks has yet to be determined, but of this we are certain, that at such times we always find uric acid in excess.

Presence of Oxalic Acid in gouty blood.—Some years since * I detected oxalic acid in the blood of a patient labouring under albuminuria: whether or not he had suffered from gout I am unable to say. The acid was separated from the watery solution of the serum, mostly in the form of octohedral crystals of oxalate of lime, but mixed with small oval bodies somewhat resembling the dumb-bell varieties of this salt. I have also examined the blood for this acid in many cases of gout, and have frequently detected it; my impression is that it chiefly occurs during the inflammatory stage of the disease, and is probably derived from the oxidation of the uric acid.

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* Medico-Chirurgical Transactions, vol. xxxii. 1849.

The whole subject, however, is beset with difficulties, and, until many other observations have been made, I should not wish to venture any positive statement, except as to the fact of the frequent occurrence of oxalic acid in the blood of gouty subjects.

Traces of Uric Acid and Urea in healthy blood.[*]—In 1848, in the postscript to my communication in the Medico-Chirurgical Transactions already referred to, I stated that I had not only discovered uric acid in the blood of gouty patients, but had found it also in healthy human blood. This statement having been somewhat misunderstood, it may be well to explain my views more fully.

It has been asserted that, as uric acid has been found in the blood in health as well as in gout, the importance of the latter fact becomes greatly diminished, but, on due consideration, this deduction will be found erroneous. In health, mere traces exist; quantities which require the employment of a large amount of blood, and the most careful chemical manipulation, to enable us to detect even its presence, and which cannot be shown by the thread experiment. The same objection might, with equal truth, be urged against the value of the presence of urea in cases of albuminuria, because I have also detected this principle in healthy blood; the difference in the amount, however, in the two cases, is very great. Traces of all the principles contained in the urine are probably present in the blood, although it is only from defective excretion that they accumulate in sufficient quantities to become the source of disease.

Carbonic acid is also a natural constituent of the blood, but it is only when its proportion is increased beyond a certain limit, that it proves injurious to the functions of the animal economy.

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[*] The blood employed in this experiment was from a stout man confined in a jail; but I know nothing of his history or habits, as to whether he inherited gout, or had or had not drunk freely.

Condition of the blood in the intervals between the attacks of gout.—It is a matter of interest to know the state of the blood in gouty patients during the absence of inflammation, and in the intervals of complete freedom from all symptoms of the disease. I have been able, though not without some considerable difficulty, in a few instances to obtain some facts which are of importance in reference to this subject, and which may be thus summed up:—

1. In the long intervals between the attacks in early cases of gout, no appreciable amount of uric acid was found in the blood.

2. As patients were recovering from an acute attack of gout, a very marked diminution of uric acid in their blood was observed.

3. In very chronic gout, the blood, even in the intervals between the exacerbations, was always discovered to be rich in uric acid.

4. In cases where symptoms of irregular gout were manifested without any accompanying joint disease, uric acid was also present in the blood.

Secretion from the skin in gout.—There are many instances on record in which a whitish powder has been noticed as developing on the skin of gouty patients, especially after profuse perspiration, and it has been frequently supposed to consist of some combination of uric acid, but in most cases assumed rather than proved to be urate of soda. Swediaur stated that he had seen a patient, labouring under a severe gouty paroxysm of several months' duration, with the entire surface of the body covered every morning with a white powder, as though he had been dusted with flour. Wolff thought he had detected uric acid in the perspiration from a patient suffering from calculus, and Dr. Mayer, of Madras, has stated that he observed it in the case of a gentleman who also suffered from stone in the bladder, and suppression of urine. In the latter instance, I think the statement is open to doubt, as the acid was obtained from the shirt worn by the patient, who had recently had a blister applied to the back, and we have shown that blister serum is at times rich in this principle.

Dr. Golding Bird, in his work on urinary deposits, also mentions having noticed the appearance of frosting, from microscopic crystals of urate of soda, on parts in which the exudation of an eczematous eruption had dried, the patient being bed-ridden with rheumatic gout, but it is not stated that these crystals were chemically examined. The most positive observations on this subject were made by Dr. Charles Petit, who affirmed that he had taken the cuticular secretion from the skin of gouty patients, at the termination of an attack of the disease, and had it chemically examined by M. Henry. The first portion was from the hand of a patient fifty-six years of age, who had suffered from the disease from the age of twenty-four; it contained about four-fifths of its weight of albumen, some lactic and phosphoric acids, chloride of sodium, and phosphate of lime, together with sensible traces of urate of soda. In another instance the matter was taken from the surface of the chest; in a third, from the back of the foot; in these specimens, also, M. Henry demonstrated the existence of urate of soda. Some objection, perhaps, might be urged against these results, especially when the matter was derived from the hands or feet; for if the patients were the subjects of deposits of urate of soda, a portion might possibly have been detached with the cuticle, as they frequently approach the surface, and even become exposed.

Some years since I adopted the following method to ascertain if uric acid is thrown out in the perspiration of gouty patients: A man was selected suffering from a severe attack of gout; he had been subject to the disease for a long time, and had many tophi, or concretions of urate of soda; his blood also gave evidence of containing a large amount of this principle. Several folds of white bibulous paper were steeped in a weak solution of potash, and applied for about thirty hours to the abdomen, protected by oil-silk. The papers were rendered acid, and found to be strongly impregnated with the perspiration, and to contain much organic matter; they were treated with rectified spirits, and afterwards with hot water, and the watery solution, when evaporated, carefully examined for uric acid. No trace of this body could be discerned by the murexide test, nor any crystals separated by the addition of acetic acid.

More recently I have made two other observations with reference to this subject: A man was selected, suffering severely from gout, with extensive deposits of urate of soda in different parts, the great toe being greatly affected, as shown in Plate I., fig. 3. The cuticle from this part being very thick, was detached, and after digestion in alcohol, treated with warm water; the watery solution was then evaporated, and acetic acid added. After remaining for some hours, a very few microscopic crystals of uric acid were discovered. In this experiment some error may have arisen from the very close proximity of the deposits of chalky matter to the surface, a fact well indicated in the drawing.

In the second case the hand, fore-arm, and arm of a gouty patient were placed in a very long and wide glass jar, the vapour being prevented from escaping by means of caoutchouc sheeting attached to the arm; a considerable quantity of the perspiration, amounting to several drachms, was thus collected and subjected to analysis. No uric acid could be discovered either in the form of crystals or by the murexide test; but in lieu of this body a considerable quantity of *oxalate of lime* was found, a portion of which had crystallised on a fibre in the evaporated liquid, and exhibited the appearance seen in Plate V., fig. 6, the drawing being made at the time. It will be observed that the crystals are of the octahedral variety, and some are aggregated in the form of rudimentary calculi. The patient from whom the perspiration was taken was suffering from an acute attack of the disease, although the arm itself was not implicated; a large amount of uric acid was present in his blood.

1863. Since the last edition of this work, I had an opportunity of examining the perspiration obtained from a patient during an acute attack of gout, at the time he was in the Turkish bath: the patient, a gentleman forty-six years of age, had suffered from gout for twenty years, at first in the feet only, but once lately in the right elbow; several ounces were obtained. Rectified spirit was at once added to prevent decomposition: it was then evaporated to dryness in a water bath, and the residue first exhausted with absolute alcohol, and subsequently with hot distilled water. From the alcoholic solution urea was obtained as the crystallised nitrate: but the watery solution failed to yield any trace of uric acid, although oxalate of lime could be detected and crystallised. The patient kindly furnished me at the same time with about three ounces of his blood, drawn before going into the bath; the serum was examined and found to be rich in uric acid.

In confirmation of this statement, Dr. Charcot remarks that in cases of uræmia, as in the collapse of cholera, *urea* has been found in the white powders obtained from the skin in parts covered with hair, but no trace of *uric acid.*

Considering the nature of the perspiration, it would hardly seem probable that a body possessing the properties of uric acid should be thrown out with it, either in its free state, or in the form of a salt; but, on the other hand, I could easily imagine, that the cutaneous secretion in eczema, or other moist skin eruptions, when occurring in patients whose blood is rich in uric acid, would contain this principle, because such secretions are alkaline, and bear a close resemblance to the serum effused by the application of a blister.

The above observations warrant the conclusion, that the *healthy* skin does not possess the power of eliminating uric acid, even when the blood is freely charged with it: this fact is of some practical importance, and will be again referred to when speaking of the value of Turkish baths, and other diaphoretics in the treatment of gout.

CHAPTER V.

URINE IN GOUT:—CHARACTERS OF HEALTHY URINE—TABLE EXHIBITING THE COMPOSITION OF URINE AND THE DAILY ELIMINATION OF ITS DIFFERENT CONSTITUENTS—URIC ACID—THE MANNER IN WHICH IT EXISTS IN THE URINE—RELATION BETWEEN THE ACIDITY OF URINE AND THE URIC ACID CONTAINED IN IT—CONDITION OF THE URINE IN ACUTE GOUT—NO EXCESSIVE EXCRETION OF URIC ACID IN MANY CASES—ELIMINATION OF THE UREA BUT LITTLE INFLUENCED—URINE IN CHRONIC GOUT—DEFICIENT EXCRETION OF URIC ACID—NO MARKED DEFICIENCY IN THE EXCRETED UREA—FREQUENT PRESENCE OF SMALL AMOUNTS OF ALBUMEN—URINE OF GOUTY INDIVIDUALS IN THE INTERVALS OF THE FITS—PROBABLE EXPLANATION OF THE FREQUENT RETURNS OF GOUT—MICROSCOPIC CHARACTERS OF THE URINE IN DIFFERENT FORMS OF GOUT—MODE OF DETECTING ALBUMEN IN URINE OF GOUTY SUBJECTS.

THE urine of the healthy human subject when first passed is of a bright amber colour, transparent, with a peculiar characteristic odour and distinct acid reaction, but when allowed to stand for a short time, a fine flocculent cloud is deposited, consisting of mucus with a few epithelium scales.

The urine is subject to numerous changes, both in appearance and composition, and hence the ancients, who only studied its physical appearances, gave different names tô that secreted at different periods of the day, as *urina potûs*, to that passed shortly after drinking; *urina cibi*, to the urine voided during the digestion of a solid meal; and *urina sanguinis*, to the urine secreted from the blood, and uninfluenced by food; urina potûs has a pale colour, and low specific gravity; urina cibi is both heavier and darker; whereas the urina sanguinis is intermediate in its characters.

It is often a matter of importance to ascertain the total amount of some one or more solid constituent eliminated in the twenty-four hours, and to effect this a sample from the whole daily secretion should be examined.

The quantity of urine passed in the twenty-four hours is subject to variations, depending on many circumstances, as individual peculiarities, the amount of fluid ingested, and the condition of the atmosphere ; it may be regarded as a rule, that between the skin and kidneys a vicarious action exists. Notwithstanding these variations, a pretty close approximation to the average may be arrived at, and it is generally considered that the daily quantity in summer is about 30 fluid ounces, in winter 40 fluid ounces, giving as a mean 35 ounces ; the specific gravity in health varies from 1015 to 1025, the average being 1020.

Dr. Parkes, in his valuable work on the composition of the urine, gives as the mean quantity in twenty-four hours, 52½ fluid ounces. This number was deduced from numerous observations made by different individuals in this country and abroad ; the variations from the mean in any one day may be considerable, although where the health is perfect they seldom extend over a lengthened period.

In composition, urine may be represented as water holding in solution certain organic substances and salts. Some of the best analyses of the urine in health are those made by M. Becquerel on several individuals of both sexes, which are especially valuable inasmuch as they include, not only the composition of this fluid in the 1000 parts, but also the total elimination during the twenty-four hours.

The following table shows the results arrived at, reduced to English grains and fluid ounces :*

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* Séméïotique des Urines, par M. Becquerel.

	MALE.		FEMALE.		MEAN.	
	Urine of 24 hours.	In 1000 parts.	Urine of 24 hours.	In 1000 parts.	Urine of 24 hours.	In 1000 parts.
Quantity of urine . .	44 fl. oz.	1000	48 fl. oz.	1000	46 fl. oz.	1000
Density	1019		1015		1017	
Water	18949·6	968·8	20642·8	975·1	19796·2	971·9
Solids	609·9	31·2	528·0	24·9	568·9	28·1
Urea	270·7	13·8	240·4	10·4	255·5	12·1
Uric acid	7·6	0·4	8·6	0·4	8·1	0·4
Fixed salts	150·5	7·7	130·0	6·1	140·3	6·9
Organic and Volatile Saline Matters .	181·1	9·3	149·0	8·0	165·0	8·6

Under the head of *fixed salts*, chlorides, phosphates and sulphates of potash, soda, lime, and magnesia are included; and under *organic and volatile saline matters*, creatine and creatinine, hippuric acid, colouring, and many at present undefined extractive matters are grouped, with traces of ammonia salts.

As we shall dwell particularly upon the alterations of some of these components, and especially of the uric acid and urea, when considering the urine of gouty subjects, it will be desirable to notice them a little more in detail, and also to allude to some of the more important characters of the renal secretion.

The *density* of urine is due to the solids contained in it, but we cannot determine their quantity by the specific gravity alone, as the same weight of different substances gives very different degrees of density. When the whole of the urine of the day is collected, the diet of the patient remaining the same, the density gives a somewhat close approximation to the quantity of solids, and a tolerably accurate deduction may be drawn.

It must be remembered that in health the urine is acid, although at different periods of the day its acidity is subject to considerable variations, depending on the state of the digestive process. It has been clearly shown by the late Dr. Bence Jones that immediately before a meal the urine exhibits the highest degree of acidity: that which is passed from two to five hours after food is always less acid; the decrease being greatest three hours after breakfast, and about five hours after dinner, when the lowest point is reached; the acidity then increases until immediately before the next meal, when it attains its highest limit; animal food is found to cause a greater and more permanent decrease of acidity than vegetable. There is one fact that must be carefully borne in mind, namely, that the presence of *uric acid* has no influence upon the acidity, which probably depends in health not on the existence of any free acid in the fluid, but upon the presence of an acid phosphate of soda.

The colour of the urine in health bears an inverse ratio to the quantity passed; but in disease, the colouring matter is subject to considerable variation, both in quantity and composition.

The daily average of *urea*, according to the above table, is 258 grains, or 270·7 grains, in the male, and 240·4 in the female. Lehmann, whose case seems somewhat exceptional, from experiments on his own person found that when living on a mixed diet he passed 500 grains; on an animal diet, as much as 819 grains; on a vegetable diet, 346 grains; and lastly, on non-nitrogenised food, 237 grains. In this country, for men in health and on good diet the average may be taken at about 500 grains, but in many of the analyses given below, the quantities are much smaller, as the patients were kept on a moderately spare diet, and were not able to take exercise. Dr. Parkes gives 512·4 grains as the average daily elimination of urea by adult males, deduced from a very large number of analyses by English and foreign physiologists, the extremes being 286 and 688 grains.

Most of the analyses upon which we shall have occasion to comment having especial reference to *uric acid*, the consideration of this principle becomes invested with considerable interest and importance. We have seen from Becquerel's table, that eight grains is the average quantity passed by the healthy human subject, and many other investigators have arrived at a similar result. Dr. William Roberts, in his excellent practical work on Urinary and Renal diseases, states that he found in three healthy young students, living on a similar diet, and under similar circumstances, the following means:—8·051 grains, 3·462 grains, and 6·071 grains; and that Dr. Hammond found in his own case the daily average as high as 14·14 grains.

Uric acid in its free state is scarcely soluble in cold water, requiring from twelve to fifteen thousand parts; it is also sparingly soluble in boiling water. How, then, does it exist in the urine, seeing that the quantity of water passed daily cannot hold these eight grains in solution? It appears from more recent observations, that uric acid is present in human urine chiefly in the form of urate of soda, which is capable of existing without decomposition in a solution of the acid phosphate of soda; hence it is evident that there is no necessary relation between the amount of acidity and the quantity of uric acid present. The experiments of Dr. Bence Jones appear to indicate that at the time the urine is very acid, there is but little uric acid present; and when uric acid exists in large quantities, the urine is sometimes even neutral in reaction. It is important to bear in mind, that the presence of a urate deposit is no necessary proof of an excess of uric acid in the urine, for urate of soda is held in solution in smaller or larger quantities in proportion to the acidity of the urine; this is readily shown by adding a drop or two of acetic acid, to a dense and almost neutral urine; if much uric acid be present, a copious cloudy deposit of urate of soda will immediately take place, which is slowly converted into crystallised uric acid. The same result often ensues, when a few drops of cold nitric acid are added to such urine, and the precipitate, which at first appears white and flaky, has often been mistaken for albumen.

Not unfrequently, if the urine be very acid, either from containing free acid at the time of its emission, or from its subsequent formation, uric acid becomes deposited in the form of rhombs, more or less coloured. Urine which has given rise to such crystalline deposits, contains scarcely a trace of uric acid in solution; it is, in fact, in the same condition as after the addition of a foreign acid.

The digestion of the food has a marked influence on the excretion of uric acid. Dr. W. Roberts gives in his work the following table, which represents the amount of uric acid passed at different hours.

Time of Day. (Dinner at 2 P.M.)	Uric acid per 1000 grains of liquid urine.	Uric acid per hour.	Uric acid per 100 grains of solid urine.
4— 7 P.M. Alkaline tide .	0·40 grain.	0·36 grain.	0·83 grain.
9—11 P.M. Acidity restored	0·18 ,,	0·13 ,,	0·34 ,,
1— 7 A.M. Urine of sleep .	0·39 ,,	0·10 ,,	0·60 ,,

Has clinical observation thrown any light upon the changes which occur in the urine in gout?

Some authors pass over the subject altogether, others content themselves with giving a very meagre account of the condition of this important fluid, and errors and discrepancies are constantly met with. Perhaps the most prevalent idea is, that uric acid is thrown out in excess, and in support of this view it is stated that copious deposits of uric acid and urates are so frequently seen in the urine of gouty patients, that the appearance of brick-dust sediments has been regarded as almost characteristic of this disorder; added to which, there is a prevalent impression that gouty patients are liable to attacks of nephritic gravel, a fact which, at first sight, appears to strengthen such an opinion.

This subject is treated more ably and fully by Scudamore than any previous writer, and the substance of his remarks may be seen in the following quotations: "The urine is of a deeper colour than natural, is secreted scantily with relation to the quantity of the patient's drink, and on cooling, deposits a pink or brick-dust sediment, with much mucus. The specific gravity is increased beyond the healthy standard. During the most urgent symptoms of the paroxysm it is usually passed with considerable irritation, both as to frequency and sense of heat. The pink or lateritious sediment appears more or less in every portion of the urine during the inflammatory symptoms."

Again, the same author observes, "A deposition of pink or brick-dust sediment on the cooling of the urine, is of such ordinary occurrence when any active symptoms of gout are present, that its connexion becomes forcibly impressed on the mind of the patient, and he gives it the name of gouty urine."

This description is intended to apply to genuine acute gout, for it is remarked in other parts of the same work, that "it now and then occurs, that for a day or two before the fit, the urine is passed copiously and of a pale colour, but this seldom happens except in persons of a nervous temperament, and whose constitutions have been much weakened by gout," and again, "in several examples of chalk-stones, both in the hands and feet, I have found by repeated experiments a deficiency, and sometimes total absence of uric acid in the urine. I must add, however, that even in patients of this class, during the paroxysm, this principle has existed in the urine in considerable quantity, and in some cases to the extent of a copious deposit of pink sediment."

The above statements as to the physical appearances of the urine in different forms of gout, are, I believe, essentially correct, and my own observations are in accordance with them, but I consider the deductions usually drawn from them to be erroneous.

M. Berthollet found that a few days prior to the access of a gouty paroxysm, the urine lost its natural *acidity*, but regained it before the termination of the fit. M. Fourcroy, in reference to these observations, expressed a desire that the urine of gouty patients should be examined, to see whether the *uric acid* was likewise deficient during an attack of the disorder. In many works it has been asserted that M. Berthollet found the uric acid deficient or absent at such times; a statement which appears to have arisen from an idea that the acidity of the urine depends on the presence of the uric acid.

I shall divide my clinical examinations of the urine in gouty patients into three classes:—

The first includes analyses of the urine in cases of acute gout; the second, examinations in patients suffering from the chronic form of the disease, and in the third class will be found the results obtained in gouty individuals at a time where there was an absence of any symptoms of their disorder.

CLASS I.—*Urine of subjects suffering from Acute Gout, in whom the general health was usually good in the intervals of the paroxysms.*

In hospital practice there is considerable difficulty in procuring these cases; for few become indoor patients for a simple attack of acute gout, and there is often a great tendency, among the labouring classes, for the disease to assume quickly an asthenic and chronic form; on the other hand, in private practice, it is not easy to procure the twenty-four hours' urine, unless the patient himself takes an interest in the investigation.

Case 1.—W. R., a male, aged 32, having no visible deposits of urate of soda upon the cartilages of the ears or elsewhere, has for seven years occasionally suffered from gout: in the first attack, the metatarso-phalangeal joints of both great toes were specially affected. At the time the urine was examined, the right foot and ankle and some of the smaller joints of the hands and the right wrist were inflamed with acute gout; there was also considerable febrile disturbance present.

March 24, 1853.—Urine of 24 hours, 35 fl. ounces; sp. gr. 1019. Clear.
Amount of uric acid in 24 hours = 5·95 grains.

No medicine was taken at the time of the examination. The blood of this patient was found to be rich in uric acid.

Case 2.—W. B., a male patient, aged 46. The attack of gout commenced at night in the ball of the left great toe; the outer side of the ankle afterwards became affected, accompanied with much pitting on pressure; febrile disturbance slight.

Feb. 20, 1853.—Urine of 24 hours, 42 fl. ounces; sp. gr. 1012·5. Acid. No deposit of urate.
Uric acid passed during the whole day = 0·84 grains.
Feb. 21.—Urine of 24 hours, 46 fl. ounces; sp. gr. 1015. Acid.
Uric acid of whole day = 1·84 grains.

Feb. 22.—Urine of 24 hours, 63 fl. ounces; sp. gr. 1012. Acid.
Uric acid of whole day = 2·52 grains.

After this time the patient took colchicum for a day or two, which produced purging; the medicine, however, had been discontinued before the next examinations of the urine were made.

Feb. 26.—Urine of 24 hours, 18 fl. ounces; sp. gr. 1023. Acid.
Uric acid of whole day = 2·30 grains.
Feb. 27.—Urine of 24 hours, 36 fl. ounces; sp. gr. 1015. Acid.
Uric acid of whole day = 2·76 grains.

From Feb. 20 to Feb. 22 the gouty symptoms gradually subsided; and after the latter date, little else remained than tenderness of the parts previously inflamed.

The blood of this patient was shown by analysis to contain much uric acid.

Case 3.—J. C., a male patient, aged 57, suffering from acute gout in the ball of both great toes, and in several other joints both of the upper and lower extremities. A few nodules of urate of soda found in the ears, but in no other parts of the body.

May 2, 1856.—Urine, 24 fl. ounces; sp. gr. 1024, at 60° Fahr. Turbid from urates, but clearing with moderate heat; it contains a distinct trace of albumen.

Uric acid in the 24 hours = 3·76 grains.
Urea, ditto = 320 grains.

The blood of this patient contained much uric acid.

Case 4.—J. P., a male patient, aged 46. Has had several attacks of gout during the last ten years; no apparent alteration of any joint produced by the disease; but in one ear a single spot of urate of soda is seen upon the helix. When the urine was analysed the patient was suffering from slight but increasing gouty inflammation, affecting both the ankles and right elbow. During the first three days that the examinations of the urine were made, no medicine was taken; on the fourth, colchicum was administered, and continued during the fifth and sixth days; under the influence of this drug the inflammation of the joints rapidly subsided.

Feb. 15, 1858.—Quantity, 58 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 8·12 grains.

Feb. 16.—Quantity, 58 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 8·12 grains.
Feb. 17.—Quantity, 43 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 3·44 grains.
Feb. 18.—Quantity, 50 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 4·00 grains.
Feb. 19.—Quantity, 59 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 2·95 grains.
Feb. 20.—Quantity, 42 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 0·17 grain.

No albumen could be detected in the urine, which was acid in reaction. The blood was found to be rich in uric acid.

Case 5.—T. D. M., a male patient, aged 50 years, for more than twenty of which he has suffered from gout; several small deposits of urate of soda upon the ears, and many of the articulations have chalk-like deposits around them. On the 8th of January, 1853, several joints were swollen and red from acute gouty inflammation, the note of the day being as follows: "Swelling, heat, redness and tenderness of the dorsum of right hand, also of both wrists; considerable pitting of the hand on pressure. Right knee swollen, red, and tender; left knee affected in a less degree; pulse 100, rather full and hard; skin hot and moist." On the 11th the gouty pains had almost subsided, and the joints were somewhat moveable; pulse 72. Jan. 15th, quite free from pain: pulse 64. Jan. 18th, cured.

On the 8th, twenty minims of colchicum wine were prescribed three times a day, with half a drachm of magnesia and fifteen minims of tincture of opium; the opium was omitted on the 11th after the pain had subsided. The urine under date January 9th, was passed between 10 A.M. January 8th, and 10 A.M. January 9th, and so on for the remaining days.

Date.	Quantity fl. oz.	Sp. gravity at 60°.	Reaction.	Appearance.	Uric acid in 24 hours: grains.
Jan. 9	10·5	1016·5	Acid.	Dark claret red. No deposit and no albumen.	0·5
„ 10	26	1014	„	Ditto.	1·7
„ 11	32	1013	„	Lighter colour. Uric acid deposit.	5·3
„ 12	36	1013	„	Clear yellow.	5·5
„ 13	28	1016		Clear.	5·5
„ 14	14	1016·5	„	Ditto.	4·0
„ 15	18	1019·5	„	Ditto.	3·3
„ 16	18	1019	„	Ditto.	3·6
„ 17	25	1016·5	„	Ditto.	3·4
„ 18	36	1015·5	„	Ditto.	2·9

At the commencement of another attack, the urine of the same patient was examined before the administration of medicine, with the following result:

Quantity, 17 fl. ounces; sp. gr. 1021. Acid.
Uric acid in 24 hours = 0·425 grain.

During acute attacks the urine of this patient always gave evidence of the presence of a small quantity of albumen, which could not be detected in the intervals.

The blood was examined at intervals during a period of some years, and yielded abundance of uric acid.

Case 6.—B. F., a male patient, aged 38, has suffered, during the last seven years, from five or six attacks of gout. No deformity of joints and no visible deposits of urate of soda in any part. From the 16th to the 19th of January suffered considerably from inflammation of the left knee, both hands, and right great toe. The urine was uninfluenced by medicine when the examinations were made.

Jan. 15, 1855.—Urine, 25 fl. ounces; sp. gr. 1012, at 60° Fahr. Acid. No albumen.
Uric acid eliminated in the 24 hours = 1·30 grains.
January 16.—Urine, 30 fl. ounces; sp. gr. 1010. Acid.
Uric acid eliminated in the 24 hours = 1·95 grains.
January 17.—Urine, 26 fl. ounces; sp. gr. 1012. Acid.
Uric acid eliminated in the 24 hours = 2·73 grains.
January 18.—Urine, 39 fl. ounces; sp. gr. 1011. Acid.
Uric acid eliminated in the 24 hours = 2·14 grains.
January 19.—Urine, 47 fl. ounces; sp. gr. 1009. Acid.
Uric acid eliminated in the 24 hours = 3·05 grains.

The blood of this patient was rich in uric acid.

Case 7.—W. F., a male patient, aged 41, has had several attacks of gout during the last ten years. Some small deposits of urate of soda are seen on the palmar surface of left index finger, but none on the cartilages of the ears. An acute attack is now passing off (March 27th).

March 27, 1858.—Urine, 24 fl. ounces; sp. gr. 1024. Acid in reaction. Of an amber colour, and depositing a yellow urate sediment on cooling.

Uric acid passed in 24 hours = 5·20 grains.

Urine crystallised freely with nitric acid from the large amount of urea.

April 8.—Has been free from all acute symptoms for some days. Urine, 48 fl. ounces; sp. gr. 1017. Acid. Clear, no deposit.

Uric acid passed in the 24 hours = 1·36 grains.

From a review of these results it will be observed that, as far as hospital patients are concerned, the daily excretion of uric acid during a fit of gout is not increased—nay, often notably diminished: taking the average normal excretion at 8 grains in the twenty-four hours, it will be seen that in the seven cases just detailed the highest amount reached was only 8·12 grains, the lowest 0·425 grain, and the averages of the seven cases, 5·95—2·05—2·58—3·76—4·46—3·28—3·28 grains, giving a total average derived from all the analyses 3·62 grains. Several of the urines were high coloured, some were turbid from urates, and in others there was a deposition of crystallised uric acid; in a few, the secretion was clear and free from all sediment.

The above results were, as I have before observed, obtained from hospital patients, and I have made but few analyses myself, nor can I find any made by other observers, showing the daily elimination of uric acid in acute gout among members of the higher classes of society, although I have been frequently able to determine this point in the more chronic forms of the disease. I am convinced that the prevalent idea that there is always an excess of uric acid in the urine, in the acute forms of the disease, is derived from the fact that, when febrile disturbance runs high, the renal secretion becomes scanty, its acidity is increased, and therefore almost the whole of the uric acid becomes deposited and is rendered visible to the eye: at the same time, the colouring matters of the urine, being combined with the deposit, add greatly to this appearance of excess.

Having established the fact that patients suffering from acute gout do not excrete an excess of uric acid, but rather the reverse, it becomes an interesting question to ascertain whether this defect depends on any diminution in the formation of the acid in the economy, or on its imperfect excretion by the kidneys. This question is fortunately not difficult to answer, for in every instance above recorded the blood was examined, and proof afforded that in all cases there existed an abnormal quantity of uric acid in the serum; thus proving indubitably that the renal organs were unable to excrete the uric acid; and, as the elimination of this acid was shown to be under the average, demonstration was afforded that the kidneys had lost, at least for the time, some of their normal excreting power. In many other diseases, as of the liver and spleen, although the production of uric acid may be greatly augmented, still, the kidneys retain their eliminating power, and the blood is thus kept free. The knowledge of these facts is of considerable importance, for it is frequently assumed that the appearance of a large quantity of uric acid in the urine indicates a contaminated state of the blood, whereas on reflection it will be evident that it favours the opposite view, for if the kidneys excrete freely, the blood has a much greater chance of remaining pure.

Another result obtained from the above analyses shows that in acute gout the quantity of uric acid eliminated on different days is liable to much variation: in the early stages of an attack, the excretion of this acid is usually small, it then gradually augments, and when the fit is passing off again diminishes. In Case 4, the quantity was greatest during the first two days, but in this instance the analyses were not undertaken until the disease was abating.

My present experience on the subject shows that in the earlier stages of acute gout the urine is scanty, and the uric acid, measured by the twenty-four hours' excretion, diminished; that the acid is thrown out in much larger quantities as the disease is passing off, and that then amounts even above the patient's daily average may be excreted, forming the so-called critical discharges; that after a time the uric acid is again lessened, although not to the extent observed prior to or at the commencement of an attack.

The daily amount of *urea* was estimated, in one of the above cases, and found to be 320 grains; a fair average for a patient on a low diet. The elimination of the urea in gout is not affected in the same ratio as the uric acid, although I have ascertained from repeated experiments, that the blood in the acute forms of the disease usually contains a small amount of the former principle.

Sometimes a very distinct trace of *albumen* is present in the urine in acute gout; this occurred in two of the cases above quoted; the phenomenon is not, I believe, at all common in the early attacks, but as the disease assumes a chronic condition, and especially when deposits of urate of soda are seen, some traces of albumen are frequently present during the fit, although in the intervals there may not be the slightest evidence of this substance.

CLASS II.—*Urine of subjects affected with Chronic Gout; the majority at the time the examinations were made having no very urgent symptoms, but suffering from the sequelæ of this disease, as concretions of urate of soda in different parts of the body, and stiffened and deformed joints.*

CASE 1.—J. H., a male subject, aged 45 years. Has had gout for fourteen years; deposits of urate of soda present on the cartilages of the ears, but the joints not deformed. When the urine was examined, he was suffering in the feet and ankles, and also in the right knee. No medicine was administered at the time.

March 30, 1853.—Urine, 56 fl. ounces; sp. gr. 1011. Clear, yellow, not giving rise to any deposit; a slight trace of albumen present.

Uric acid in 24 hours = 5·78 grains.

The blood contained much uric acid.

CASE 2.—J. M., a gentleman, aged 85 years. Has suffered from gout for fifty years. Concretions of urate of soda extensively diffused over his body; gouty abscesses of fingers, discharging chalk-like matter.

June, 1856.—Urine passed at 3 P.M., sp. gr. 1017. Pale yellow; clear; gives evidence of a small amount of albumen.

With hydrochloric acid this urine only deposited a few crystals of uric acid, requiring the microscope to detect them.

The urine of the same patient passed during the night was pale, sp. gr. 1018. Acid, with distinct traces of albumen; and gave, when acidulated with hydrochloric acid, only a few microscopic crystals of uric acid.

CASE 3.—W. L., a gentleman, aged 61. Has suffered many years from gout, his hands and feet much deformed from the presence of extensive deposits of urate of soda.

May, 1857.—Urine, passed three or four hours after dinner, of a pale yellow colour; sp. gr. 1015. Acid in reaction; slightly, though decidedly, albuminous. When acidulated with hydrochloric acid, gave a few microscopic crystals of uric acid, not sufficient to collect and weigh.

Case 4.—A male patient, aged 52. Has suffered from gout for many years; some deposits of urate of soda seen on both ears, but not elsewhere. No active gouty symptoms at the time of the urinary examination; urine always pale, and free from deposits.

October 22, 1849.—Urine, 72 fl. ounces; sp. gr. 1010.
October 27.—Urine, 56 fl. ounces; sp. gr. 1012, at 60° Fahr.
Uric acid from 24 hours' urine = 0·38 grain.
November 4.—Urine, 52 fl. ounces; sp. gr. 1009, at 60° Fahr. Acid.
Uric acid in 24 hours = 0·20 grain.

The blood was found to be rich in uric acid.

Case 5.—R. H., a male subject, aged 41 years. Suffering from chronic gout of several years' standing; a few nodules of urate of soda seen upon the cartilages of the ears, and on the palmar surfaces of one or two fingers, near the extremities. No active gouty symptoms present at the time the analyses were performed.

June, 1847.—Urine, 42 fl. ounces; sp. gr. 1015. Acid; pale in colour; very slightly albuminous.

Uric acid from the 24 hours' urine amounted to only a few microscopic crystals.

Many other examinations of this patient's urine were made within the course of the following month or six weeks with a like result.

It was in this patient's blood, at the time above referred to, that I first discovered the presence of uric acid; from it also I was enabled to crystallize urate of soda in the form shown, Plate V., fig. 4.

Case 6.—D. R., a male patient, aged 45 years; has suffered from gout for more than ten years; deposits of urate of soda observed on the ears, and some distortion of the hands.

Urine, 65 fl. ounces; sp. gr. 1014. Clear; acid.
No uric acid could be obtained from the entire 24 hours' urine.

Case 7.—W. B., a male patient, aged 52. Has suffered from gout for many years, and is much deformed by extensive deposits of chalk-stones, the joints also much stiffened and distorted. Pain and tenderness of different joints almost always present, and there are several gouty abscesses discharging chalky matter. Many examinations of the urine were made at different periods.

September 1848.—Urine, 50 fl. ounces. Pale. Acid.
Uric acid obtained from the 24 hours' urine = 0·5 grain.
December 9.—Urine, 36 fl. ounces; sp. gr. 1014. Acid.
Uric acid in 24 hours amounted only to a few microscopic crystals.
December, 1849.—Urine, 60 fl. ounces.
Uric acid, from 24 hours' urine, not in sufficient quantity to weigh.
February, 1850.—Urine, 60 fl. ounces.
Uric acid, from 24 hours' urine, amounted only to a mere trace.

In all the examinations of this patient's urine, a distinct trace of albumen was detected.

Case 8.—D. M., a female patient, aged 39. Of spare habit; although the first attack occurred three years since, she is already extremely deformed from large chalk-like deposits about the hands and feet; some of the joints more or less swollen and painful.

1848.—Urine, amount not ascertained; pale; acid; sp. gr. 1010; slightly albuminous. When treated with hydrochloric acid it yielded no trace of uric acid.

Case 9.—W. M., a male patient, aged 52. Has suffered many years from gout; at present has considerable stiffness of joints, and deposits of urate of soda upon the ears and elsewhere. No active symptoms present during the time of the urinary examinations.

March 29, 1853.—Urine, 35 fl. ounces; sp. gr. 1016. Clear, yellow; not giving rise to any deposit, but yielding distinct evidence of the presence of albumen.
Uric acid in 24 hours = 2·5 grains.

This patient's urine was examined on various occasions during the course of many years; it frequently gave but a mere trace of uric acid, but some albumen was always present. The blood was also analysed, and found to be charged with uric acid.

Case 10.—W. F., a male patient, aged 38. Has had several attacks of gout, at first implicating only the ball of the great toe, but afterwards affecting the joints of both upper and lower extremities; a few spots of urate of soda seen on the palmar surfaces of the left index finger. No active symptoms present when the urine was submitted to examination, and no medicine taken at the time.

May 11, 1854.—Urine, 35·5 fl. ounces; sp. gr. 1024. Acid. No deposit. No albumen.
Uric acid in the 24 hours = 1·34 grain.
Urea, ditto = 306 grains.
May 12.—Urine, 32 fl. ounces. Acid.
Uric acid in the 24 hours = 0·76 grain.
Urea, ditto = 333 grains.
May 13.—Urine, 30 fl. ounces; sp. gr. 1025.
Uric acid in the 24 hours, too small in quantity to weigh.
Urea, ditto = 344 grains.
May 15.—Urine, 39·5 fl. ounces; sp. gr. 1018. Acid.
Uric acid in the 24 hours, a trace only.
Urea, ditto = 358 grains.
Blood found to contain much uric acid.

Nearly four years after the above date, this patient's urine was again examined. At the time of the first analysis the gouty attack was passing off; when the second was made, he was quite free from active symptoms.

March 28, 1858.—Urine, 24 fl. ounces; sp. gr. 1024. Acid. Of an amber colour, and depositing yellow urates on cooling.
Uric acid passed in the 24 hours = 5·20 grains.
April 8.—Urine, 48 fl. ounces; sp. gr. 1017; and giving rise to no deposit.
Uric acid passed in the 24 hours = 1·36 grain.

Case 11.—C. F., a male subject, aged 38. Has suffered from numerous attacks of gout for ten years; the first few were confined to the feet; he has small urate spots in the left ear, and also a semi-fluid collection of the same matter at the side of the left foot; some deposits also on the right little finger.

The urine was first examined for fourteen successive days, in January, 1854, the patient's symptoms at the time being very chronic, and the results were as follow:

Date.	Quantity, Fluid oz.	Sp. gr.	Reaction.	Physical Appearance.	Uric acid passed in 24 hours: grains.
Jan. 4	57	1012	Acid.	Clear.	0·50
" 5	44	1013	"	"	0·05
" 6	44	1013	"	"	0·00
" 7	37	1012	"	"	0·14
" 8	46	1011	"	"	0·00
" 9	44	1011	"	"	0·00
" 10	44	1012	"	"	0·71
" 11	34	1014	"	"	0·09
" 12	61	1013	"	"	2·40
" 13	55	1012	"	"	0·00
" 14	87	1009	"	"	0·00
" 15	81	1011	"	"	0·00
" 16	73	1015	"	"	0·00
" 17	84	1014	"	"	0·00

The experiments were again repeated in February.

Feb. 18.—Urine, 57 fl. ounces; sp. gr. 1012·5, at 60° Fahr. Acid. No albumen.
Uric acid eliminated in 24 hours = 1·22 grain.
Urea, ditto = 411 grains.
Feb. 19.—Urine, 51 fl. ounces; sp. gr. 1014, at 60° Fahr.
Uric acid eliminated in 24 hours = 0·71 grain.
Urea, ditto = 392 grains.
Feb. 20.—Urine, 74 fl. ounces; sp. gr. 1010, at 60° Fahr.
Uric acid eliminated in 24 hours = 0·69 grain.
Urea, ditto = 356 grains.
Feb. 21.—Urine, 50 fl. ounces; sp. gr. 1015, at 60° Fahr.
Uric acid eliminated in 24 hours = 3·65 grains.
Urea, ditto = 384 grains.

The blood of this patient was found to contain much uric acid.

The urine was once examined when this patient was under the influence of colchicum.

January 26.—Urine, 38 fl. ounces; sp. gr. 1017, at 60° Fahr.
Uric acid eliminated in 24 hours—no trace.
Urea, ditto = 288 grains.

Case 12.—C. F., a male subject, aged 35. Has had a few attacks of gout; some slight, but the last very severe, induced by a serious accident. Small concretions noticed in the ears, and around some of the joints of the fingers. No acute symptoms present when the examinations of the urine were made.

Jan. 21, urine	57 fl. oz.;	sp. gr. 1012	at 60° Fahr.	None of the specimens gave any deposit of uric acid when acidulated with hydrochloric acid, and allowed to stand 48 hours.
„ 22 „	51 „	„ 1013	„ „	
„ 23 „	59 „	„ 1014	„ „	
„ 24 „	59 „	„ 1013·5	„ „	

The blood contained much uric acid.

CASE 13.—J. P., a male patient, aged 43. For eleven years he has been subject to frequent attacks of gout, at first confined to one great toe and ankle; two small deposits of urate of soda seen on the cartilages of ears. No active symptoms present when the urine was examined.

Jan. 24, 1854, urine	70 fl. ozs.;	sp. gr. 1012.	The three specimens acidulated with hydrochloric acid gave mere traces of uric acid.
„ 30 „ „	52 „	„ 1011.	
„ 31 „ „	58 „	„ 1011.	

The blood at this time was rich in uric acid.

CASE 14.—Two years later, this patient's urine was again examined on recovery from a slight attack of gout, and when no active symptoms were present and no medicines administered. The examinations were made chiefly to ascertain the amount of urea eliminated.

February	23, 1856.—Urea, in the 24 hours	= 286	grains.
„	24 „ „ „	= 213	„
„	25 „ „ „	= 304	„
„	26 „ „ „	= 299	„
„	27 „ „ „	= 359	„
„	28 „ „ „	= 315	„
„	29 „ „ „	= 302	„
March	2 „ „ „	= 312	„
„	3 „ „ „	= 264	„
„	5 „ „ „	= 262	„
„	6 „ „ „	= 234	„
„	7 „ „ „	= 287	„

On several of the above days the urine was treated with hydrochloric acid, in order to ascertain the amount of uric acid, but on no occasion was a sufficient quantity precipitated to collect and weigh; in fact, only a few microscopic crystals could be detected. The blood at the same time contained a large amount of uric acid.

CASE 15.—T. C., a male subject, aged 57. Gout of about twelve years' standing; very large concretions observed upon the cartilages of the ears and in other parts of the body.

September, 1854.—Urine pale, of low specific gravity, with a trace of albumen; when acidulated with hydrochloric acid, gave a mere trace of uric acid.
Blood contained much uric acid.

CASE 16.—R. W., a male patient, aged 53. Has suffered from gout for fourteen years, the first and two subsequent attacks were confined to the ball of left great toe; other joints afterwards became affected. Has noticed deposits in ears for at least seven years, which are now very large, and numerous spots of urate of soda are also seen on left lower eyelid; considerable chalk-like masses exist about the hands and elbows, which are thereby much deformed and crippled.

June, 1858.—Urine passed at 12 noon, sp. gr. 1011; distinctly albuminous. Treated with hydrochloric acid, gave no trace of uric acid.

CASE 17.—T. F., a gentleman, aged 64. Has had gout for twenty years. At first confined to the ball of one or other great toe, but in course of years gradually travelling upwards. Is now suffering from chronic pains, and has some enlargements about the fingers; one of these, on being punctured, gave exit to a creamy fluid, consisting of crystallised urate of soda. No deposit upon the cartilages of ears.

Urine, 80 fl. ounces; pale yellow; sp. gr. 1013.
No trace of uric acid when acidulated with hydrochloric acid.

On another occasion, the urine of this patient gave a moderate deposit of uric acid crystals.

A glance at the foregoing analyses will at once show that there is a marked diminution of the uric acid in the urine of patients suffering from chronic gout; in no case did it exceed 5·78 grains, and this occurred on one day only; the next highest number representing the elimination of uric acid is 3·57 grains, and even this was very exceptional; the total average of all the analyses in the second class of cases is exceedingly low, far under a single grain. Several urea determinations of these urines were likewise made; four in Case 10, where the quantities were found to be 306 grains, 333 grains, 344 grains, and 358 grains, giving an average of 335 grains; and it will be noticed that, although the quantity of urea remains nearly constant and normal in quantity, the uric acid is not only exceedingly deficient, but subject to the greatest fluctuations, varying in the four days from 1·34 grains to a quantity too small to be collected and weighed. Again, in Case 11, four determinations of the urea give 385 grains as the daily average, with but a slight difference between the mean and extremes, the uric acid during the same period exhibiting the same violent variations as in Case 10; namely, from 3·65 grains to 0·71 grain, and on another occasion from 2·4 grains to 0·0 grain. In Case 14, the urea was determined, with one exception, on twelve successive days: the average was found to be 286 grains, the extremes being 213 grains and 359 grains. On several of the above occasions an attempt was made to estimate the uric acid, but in no analysis was a quantity found sufficiently large to collect and weigh. From these observations it is evident, that in cases of chronic gout the kidneys may retain intact their function of excreting urea from the blood at the time that the power of eliminating uric acid is seriously impaired.

Another fact of interest shown by these examinations is the frequent presence of a small amount of albumen in the urine of chronic gout. In ten out of the seventeen cases it is stated to be present, and it is possible that in some of the remaining seven it might have existed, as its absence is not always specially noted. The quantity of albumen is not usually large, but sufficient to give a distinct haziness when the urine is boiled, which remains after the addition of nitric acid.

In conclusion, it may be stated that the more common appearances and characters of the urine in chronic gout, as shown by these and other examinations, are as follows:—

It is rather paler than healthy urine, of lower density, and increased in quantity.

The amount of urea, except in extreme cases, remains much as in health; the character of the diet being taken into consideration.

The uric acid is very much diminished, and liable to be excreted in an intermittent manner. A small amount of albumen is very frequently present.*

The occurrence of deposits in the urine is not common; they occasionally occur during the cooling of the fluid, either in the form of urate of soda, or as rhombs of uric acid, more or less coloured.

CLASS III.—*Urine of individuals occasionally suffering from attacks of Gout; examined at the time of complete freedom from symptoms.*

CASE 1.—The first three analyses were of the urine of a gentleman, 40 years of age, rather tall and stout, subject to occasional attacks of gout in the ball of the great toe, but having never had any other joint affected; health otherwise good.

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* Dr. Charcot, in his annotations to the French edition of this work, remarks that the observations above made have been confirmed by Lehman, Ranke, and Bartels.

January 16, 1852.—Urine, 41·5 fl. ounces; clear, amber colour; acid; sp. gr. 1024, at 60° Fahr. Contains no albumen, and gives rise to no deposit on cooling.

Uric acid eliminated in the 24 hours = 4·72 grains.

January 17.—Urine, 43 fl. ounces; sp. gr. 1022. Acid. Gives rise to a light pinkish coloured deposit of urates on cooling.

Uric acid eliminated in the 24 hours = 6·50 grains.

January 21.—Urine, 47 fl. ounces; sp. gr. 1023. Clear, amber coloured. No deposit on cooling.

Uric acid eliminated in the 24 hours = 3·85 grains.

CASE 2.—A gentleman, aged 56. Has suffered from gout for many years, and has had the larger joints of the body affected as well as the great toe.

February 12, 1851.—Urine, 60 fl. ounces; sp. gr. 1014, at 60° Fahr. Free from albumen.

Uric acid eliminated in the 24 hours = 4·26 grains.

A small blister applied at another period yielded a fluid which contained a considerable amount of uric acid.

CASE 3.—M. C., a lady, about 38 years of age, who had suffered from atonic gout for many years, but is free from any external deposits of urate of soda, and from deformity or stiffness of joints.

Urine, 42 fl. ounces; pale in colour; no albumen; sp. gr. 1019, at 60° Fahr.

Urea eliminated in the 24 hours = 373 grains.
Uric acid, ditto, no trace.

CASE 4.—J. L. R., a male subject, aged 48. Has suffered from three attacks of gout, the great toe being especially affected in each attack. No deposit of urate of soda visible either upon the cartilages of the ears or any other part of the body,

February 21, 1854.—Urine, 58 fl. ounces; sp. gr. 1015, at 60° Fahr.

Uric acid eliminated in the 24 hours = 2·93 grains.

February 23.—Urine, 88 fl. ounces; sp. gr. 1080, at 60° Fahr.

Uric acid eliminated in the 24 hours = 1·23 grain.
Urea, ditto, = 385 grains.

February 24.—Urine, 60 fl. ounces; sp. gr. 1014, at 60° Fahr.

Uric acid eliminated in the 24 hours = 1·82 grain.
Urea, ditto, = 335 grains.

February 25.—Urine, 77 fl. ounces; sp. gr. 1011, at 60° Fahr.
Uric acid eliminated in the 24 hours = 1·69 grain.
Urea, ditto, = 370 grains.
February 27.—Urine, 64 fl. ounces; sp. gr. 1013, at 60° Fahr.
Uric acid eliminated in the 24 hours = 0·19 grain.
Urea, ditto, = 338 grains.
The blood taken during the fit was found rich in uric acid.

At the time this patient's urine was examined for urea and uric acid, it was clear and free from deposits; but during the attack, which was very severe, the urine became turbid on cooling from the deposition of red urates; no albumen was present at any period.

Case 5.—T. B., a male patient, aged 54, has suffered from numerous attacks of gout, chiefly in the great toe; no deposits of urate of soda visible in any part. He was free from all symptoms, and had omitted medicines for some time before the examinations of the urine were made, but a few days afterwards he had a return of gout. The patient was allowed a moderate amount of meat.

May 11, 1854.—Urine, 60 fl. ounces; clear; acid; sp. gr. 1019.
Uric acid eliminated in the 24 hours,—a mere trace.
Urea, ditto, = 372 grains.
May 12.—Urine, 54 fl. ounces; acid; sp. gr. 1017.
Uric acid eliminated in the 24 hours,—too small to collect and weigh.
Urea, ditto, = 441 grains.
May 13.—Urine, 74 fl. ounces; sp. gr. 1015.
Uric acid eliminated in the 24 hours,—a mere trace.
Urea, ditto, = 569 grains.

The serum of the blood examined during the attack was found to be rich in uric acid.

Case 6.—S. N., a male subject, aged 68. Has suffered for many years from repeated attacks of gout, chiefly in the great toes, but other joints have occasionally been affected.

February 21, 1854.—Urine, 55 fl. ounces; sp. gr. 1013.
Uric acid eliminated in the 24 hours = 1·93 grain.
Urea, ditto, = 317 grains.
February 22.—Urine, 50 fl. ounces; sp. gr. 1014.
Uric acid eliminated in the 24 hours = 2·28 grains.
Urea, ditto, = 312 grains.

February 23.—Urine, 44 fl. ounces; sp. gr. 1014.
Uric acid eliminated in the 24 hours = 1·60 grain.
Urea, ditto, = 275 grains.
February 24.—Urine, 29 fl. ounces; sp. gr. 1016.
Uric acid eliminated in the 24 hours = 1·48 grain.
Urea, ditto, = 234 grains.
February 25.—Urine, 40 fl. ounces; sp. gr. 1014.
Uric acid eliminated in the 24 hours = 2·72 grains.
Urea, ditto, = 269 grains.

This patient had taken small doses of the extract of colchicum in the form of pills for several days previous to the 21st, and on the 22nd was ordered to omit the drug, on account of the occurrence of slight diarrhœa; this continued more or less till the 25th. From his own statement there was no loss of urine during that time.

It will be seen from the above cases that in no one of the six patients did the amount of uric acid excreted in the twenty-four hours exceed the healthy average; in the majority it was far below. From these and other less complete examinations I am inclined to think that in individuals who suffer frequently from gout, even though no visible deformity or deposits have resulted therefrom, the kidneys lose to some extent their power of excreting uric acid, and that the blood is often kept impure from its presence. This is probably one cause of the extreme liability of such patients to periodic visitations of the disease, and of the great difficulty in effecting its radical cure.

It is interesting to observe that in these individuals, as well as in those suffering from acute or chronic gout, the urea-eliminating function of the kidneys remains comparatively intact.

Microscopic examination of the Urine in Gout.—The urine of gouty patients sometimes exhibits microscopic characters of great value in arriving at a correct prognosis of the disease. In the early stages of gout in individuals otherwise healthy, the information obtainable from microscopic examination of this fluid is of little moment. The urine, perhaps, exhibits a deposit of urate of soda, varying in hue from pale buff to bright pink, or brickdust red, and in the form either of small amorphous granular masses or groups of spiculæ; or there may be sediments of crystallised uric acid; or the two may be combined; but as these are frequently noticed in other diseased conditions of the system, the information they afford is slight.

When, however, the affection becomes chronic, and more especially when extensive deposits are forming around the joints, then other phenomena are frequently observed. Along with the small amount of albumen which we have found to be so common, casts of tubes are met with, generally of a granular character, and consisting of disintegrated epithelium, more or less moulded into the shape of the tubes. Sometimes these are seen during the acute exacerbation, but not in the intervals. The appearance of granular casts indicates that a desquamative process is going on from the lining membrane of the uriniferous tubes, a change closely connected with deficient secretion of some of the elements of the urine, and more especially of the uric acid.

When the disease is still further advanced, a condition commonly evidenced not only by the fearfully crippled state of the patient, but likewise by the occurrence of other more serious symptoms, as epilepsy, paralysis, and coma, due to imperfect elimination from the kidneys, then not only does the urine become permanently, though perhaps slightly albuminous, but the granular casts are more or less replaced by others of a waxy or fibrinous nature; these latter forms are seen in fig. 7, mixed with some of the granular variety.

Several of the cases illustrative of chronic desquamative nephritis, related by Dr. G. Johnson, were the subjects of chronic gout.

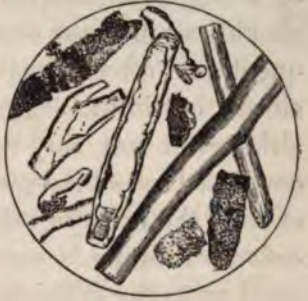

Fig. 7.*

In the latter stages of gout, copious deposits of uric acid, or urates, are seldom met with, and the urine becomes brighter and more natural in appearance; this change often impresses the patient with the idea that an improvement has commenced, whereas, in fact, it is an indication that the kidneys have become deficient in their power of throwing out uric acid.

We have already alluded to the intermittent manner in which the uric acid is sometimes eliminated in gouty cases. For days, scarcely a trace may be thrown out, and then suddenly such an amount as to be rapidly deposited in a crystalline form, when the urine is allowed to cool. Lastly, oxalate of lime is of frequent occurrence in the urine of gouty patients, but as it is found in so many other diseases, its presence is of no value as a diagnostic mark. More commonly it is found in octahedra, rarely in dodecahedra, and occasionally in the dumb-bell variety.

Although I have not been able to find the leisure necessary for making many further quantitative analyses of the urine since the publication of my last edition, still I have had full opportunities of testing the accuracy of most of my former statements, more especially in cases occurring in the higher ranks of life. I feel assured that the presence of a slight amount of albumen is very common in the chronic form of the disease; on a rough estimate derived from many hundred cases I should say in about one half; in acute gout it is less frequent, and often disappears after the paroxysm has subsided; but in the chronic variety it is usually permanent, although it may vary much in amount. Experience has convinced me of the great importance of attending to this state of the urine in reference to the treatment of the disorder. I am no less convinced of the truth of my statement as to the deficiency of uric acid in gouty urine, and as to the defective elimination generally bearing a close relation to the inveterate character of the malady.

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* Fig. 7. Casts of tubes, some granular, some waxy or fibrinous in character, drawn from a specimen kindly lent by Dr. G. Johnson. Linear magnifying power, 220.

Before concluding this subject I wish to make myself clear with regard to the frequent occurrence of albumen in the urine of gouty subjects. I often have occasion to examine urine which is said not to contain albumen, and yet I find distinct traces. The mode of examination I adopt is to put the urine to the depth of about three inches into a long and somewhat narrow test tube, and then slowly to bring only the upper half to the boiling point by means of a spirit lamp; if there is even a trace of albumen, it will be thus discovered, as we have the means of comparing an upper and lower stratum of the same urine; a few drops of nitric acid are afterwards added in order to make sure that the turbidity is due to albumen—and to avoid any error which may arise from testing a neutral or alkaline urine. In chronic cases it is a trace of albumen which is to be expected; and its presence is an indication that the kidneys have probably been attacked by gout; the existence of a large quantity of albumen is comparatively rare.

CHAPTER VI.

THE MORBID ANATOMY OF GOUT:—GREAT IMPORTANCE OF THE SUBJECT—CHANGES IN THE JOINTS OBSERVED BY PORTAL, MORGAGNI, DR. MONRO, AND OTHERS—CRUVEILHIER'S OBSERVATIONS—THE AUTHOR'S INVESTIGATIONS—1. CASES OF CHRONIC GOUT WITH EXTENSIVE CHALK-STONES AND DISTORTIONS—2. SUBJECTS EXHIBITING POINTS OF DEPOSITION ON THE EARS ALONE—3. CASES IN WHICH NO DEPOSIT OR DEFORMITY EXISTED—4. WHERE ONLY THE BALL OF ONE GREAT TOE HAD BEEN AFFECTED WITH GOUT—5. WHERE A SINGLE ATTACK OF GOUT HAD OCCURRED MANY YEARS PREVIOUSLY.

IT is commonly remarked, in works devoted to the consideration of gout, that morbid anatomy has effected little towards the elucidation of the nature of the disease; that although alterations of structure have been found in many cases, still these have been insufficient and too much wanting in constancy and precision to be depended on. I hope, however, to be able to show that at the present time this remark is no longer correct, and that the study of those changes, which I shall demonstrate to be constant in all cases of the disease, throws considerable light upon the true nature of gout. Considering this part of the subject of the highest importance, I shall not hesitate to devote considerable space to its investigation, and shall endeavour to present to the reader all that is important concerning it, some portion of which has only been satisfactorily proved within a very recent period—I allude especially to the early changes of structure in the joints, and to the frequent or almost constant affection of the kidneys.

It has been long known that changes in and around the joints occasionally take place in gout, owing to the deposition of a chalk-like matter, principally composed of urate of soda, but this phenomenon has generally been looked upon as rather exceptional, and as occurring only in individuals who have suffered from the disease in its most inveterate and protracted forms, and no idea was entertained that any necessary relation existed between gouty inflammation and such deposition.

M. Portal, in his "Anatomie Médicale," assures us he has seen the synovial secretion of the consistence of jelly, or even sometimes so thick as to have the appearance of plaster; he also observed the bones of the feet covered with this white matter after prolonged and severe gout. Morgagni relates the same in his account of the examination of the joints of a Venetian nobleman.

Dr. Monro, jun., in his "Outlines of Anatomy," remarks, "The extremities of the bones of the feet and hands have been said to be occasionally converted into a white substance like chalk in persons who have been long afflicted with gout," and in the first volume of the Medical Communications, 1782, Mr. Henry Watson relates the appearances found in the body of an extremely gouty subject and well known character, a Mr. Middleton; the most important points of his examination are as follows:—One of the great toes was much enlarged, and on dissection the ball or first joint was found, as if encased in a bed of chalk, like a fossil shell, but the bone itself was neither increased in size nor altered in structure. The joints of the fingers were also swollen and knotty, each knot being a lump of chalk, and, when he played at cards, he used frequently to score up the game with his knuckles. On the middle of the right tibia there appeared an oblong tumour resembling a node, over which the integuments were very thin and ready to burst; it was a mere deposition of chalk between the skin and periosteum, and though thick and large, had not as yet done any injury to the bone.

Mr. Middleton had complained of excruciating pains in his head, often imagining he was tumbling headlong; this was especially the case a little before his death. The dura mater was found indurated, the substance of the brain firm, with a clear fluid in the ventricles; the pia mater was pale, and on its outer surface was a cream or smooth chalk-like mucus. The heart was healthy, and also the thoracic aorta; the aorta, however, was ossified from the diaphragm to the iliac arteries. The kidneys were much diminished in size, and contained hydatids, and the outer surface of the right kidney was studded with little bladders. No calculi or chalk were observed in the kidneys or urinary bladder.

The synovial fluid in the joints of the lower extremities was as thick as cream, like a mixture of chalk, oil, and water, but the cartilages were not much altered.

In the lobe of one lung a small stone was discovered, and the tracheal glands were filled with white matter.

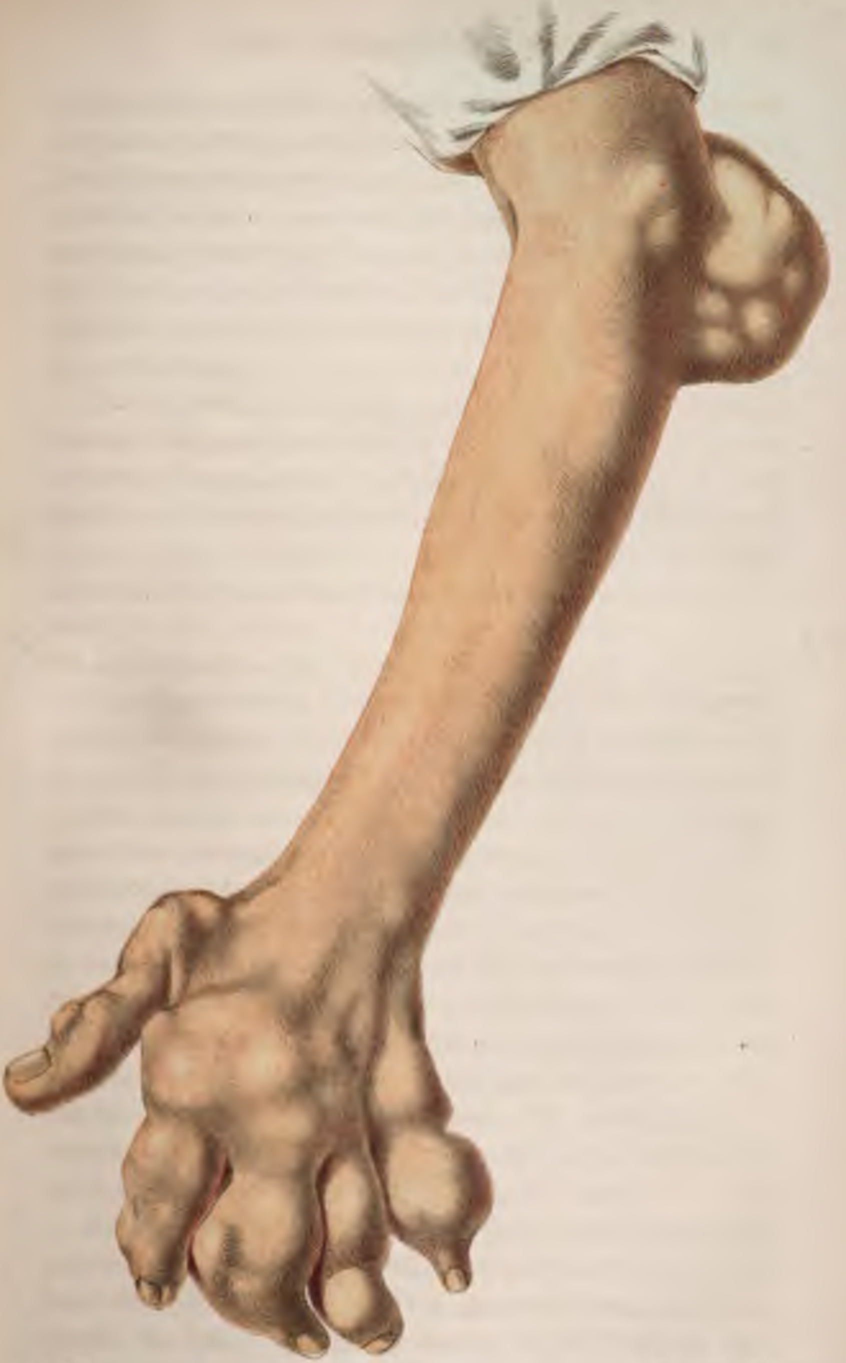
It must be borne in mind that Mr. Watson was not at all aware of the nature of the chalky substance above spoken of, and had no power of chemically distinguishing deposits of urate of soda from those of carbonate and phosphate of lime, and therefore we have no proof that the white matter in the bronchial glands and the small stone in the lung contained uric acid, or were in any degree related to the deposits in and around the joints, or had any connection with the gouty disease.

Cruveilhier, in his "Anatomie Pathologique," has given a plate delineating some of the appearances observed in the joints of a patient suffering from chronic gout. In the knee-joint the condyles of the femur were seen to be covered with the plaster-like substance, stated to penetrate to the bone, and the same matter was also noticed on the synovial fringes. The articulating surface of the patella had the like deposits arranged more or less linearly; on its anterior surface two sub-cutaneous synovial capsules were found, the walls of which were thick and cartilaginous and sprinkled throughout with white points, and the contained liquid had the appearance of chalk and water; the fibrous layer covering the patella, as also the various tendons, were similarly affected.

In the ankle joint a like encrustation was observed, and deposits were found in the two lateral and posterior ligaments; the lateral and superior surfaces of the astragalus were also covered with the white matter.

On making a section of the astragalus, Cruveilhier observed within the substance of the bone, and at a small distance from the cartilage, little cretaceous masses which he had also noticed near the calcanean surface of the bone, the neighbouring cartilage being in a perfectly healthy condition; the so-called cretaceous matter was evidently supposed by Cruveilhier to be of the same nature as the substance on the cartilages themselves. Small masses of deposit were likewise seen in the adipose cellular tissue, which covers the plantar and lateral faces of the os calcis, and also in the tendo Achillis. In the foot some of the articulations, as the astragalo-scaphoidean, calcaneo-cuboidean, and astragalo-calcanean, were nearly free from deposit, but those of the scaphoid bone, with the three cuneiform and cuboid bones, and the cuneiform bones among themselves were encrusted, as likewise the metatarso-tarsal articulations, and the meta-

Pl. II.



G. H. Ford.

Mintern Bros. Chromo.

London, Longmans Green &c.

tarso-phalangeal joint, or ball of the great toe. Linear deposits of chalky matter were seen on the periosteum, around the metatarsal bone and phalanges, the phalangeal articulation was anchylosed, and the cartilages apparently destroyed from deposition. The tendon of the flexor longus pollicis was covered with the concretion on both surfaces, as also were the ligaments surrounding the great toe.

The thumbs and little fingers were similarly affected, but the intermediate fingers very slightly so; the subcutaneous capsule of the elbow contained a plaster-like matter, the joint itself being healthy, but in the cellular tissue, along the course of the biceps, and even within some of the muscles, granular chalky concretions were found.

M. Guilbert in his work ("De la Goutte et Maladies Goutteuses," 1820,) and M. de Castelneau ("Archives générales de Médecine," 1843,) have also published some interesting facts on the pathological anatomy of gout.

The results arrived at from the above examinations may be thus summed up. In many cases of severe and protracted gout, deposits of chalky matter (urate of soda) occur around and within the joints, and upon the surface of their fibrous tissues; the synovial fluid becomes thick, now and then even of the consistence of putty, the joints are either partially or completely anchylosed by the rigidity of the surrounding ligaments, and some of the smaller ones, especially the great toe, occasionally so completely surrounded with deposits as to exhibit the appearance of being inclosed in a chalky case.

The dissections hitherto given have been confined to gouty subjects who had suffered from the disease in its most severe and protracted forms; from these alone we should be quite unable to arrive at any definite conclusion as to the occurrence of any constant changes during gouty inflammation. Considering this a most important point to determine accurately, I devoted much attention to its consideration some years ago, and was enabled to elucidate satisfactorily the real nature of these alterations.

In order to render the subject as clear as possible, I will shortly lay before the reader the results derived from many autopsies of gouty subjects, some of whom died during the presence of gouty inflammation, most however in the intervals, from accidents or from maladies totally independent of gout; in commenting upon these, I shall first describe the alterations seen in and around the articulations, and afterwards treat of the changes in other structures.

I.—*Examination of subjects of Chronic Gout, with extensive chalk-stones.*

Case 1.—1855. W. M., a man 55 years of age, a compositor by trade, not known to have any hereditary predisposition to gout, but a brother had suffered from the disease; he had formerly indulged in malt liquors and spirits, and altogether lived rather freely. About fifteen years before his death he had the first attack of gout, which was confined to the ball of the great toe; after a time, the disease became more general, gradually creeping upwards until nearly all the joints of the body became implicated; deposits of urate of soda had been observed for many years upon the cartilages of the ears, and around many of the smaller joints, especially of the hands, some of which had approached the surface and had been discharged by ulceration. Many of the articulations were anchylosed and otherwise deformed, and some of the bursæ, especially that over the left olecranon process, were much distended from deposition of chalky matter, the elbow however was less swollen than that represented in Plate II. Albumen had been detected in his urine for some considerable time, with casts, and of late the renal affection had much increased, and had been accompanied with some œdema of the lower extremities. The cause of his death appeared to have been exhaustion from the almost constant presence of gout in one or more joints, hastened by a severe shock to his nervous system.

On opening the left knee-joint, the synovial fluid was found thickened, and on close examination exhibited minute white specks of urate of soda. (Plate V., fig. 3.) The condyles of the femur were extensively covered with the deposit, not simply arranged in streaks, but occupying a large amount of their surfaces, except at the outer margin, where the synovial fringes are situated; the end of the tibia was coated, but less freely than the femur; the articulating surface of the patella was likewise encrusted.

The appearance presented when the joint was first examined, is accurately depicted in Plate III., fig. 3, *a*, *b*, *c*, a drawing taken from a wax model made at the time. The synovial membrane was very vascular, and numerous white granules could be observed and felt upon the surface, consisting also of urate of soda; deposits were likewise found on the crucial ligaments and fibro-cartilages. The right knee exhibited in every respect the same peculiarities as the left; all the articulating surfaces being freely covered with deposit, as well as the fibro-cartilages and ligaments, and the same changes were observed in the synovial membrane and fluid.

Many other joints were partially examined, as the elbow-joints, also several of the carpal and metacarpal, tarsal and metatarsal, and phalangeal articulations; for the most part the surfaces were covered with a white coating of urate of soda. The ball of each great toe was completely encrusted.

The kidneys weighed respectively $2\frac{3}{4}$ and 3 ounces avoirdupois; were pale and contracted; the cortical portion shrivelled, points and streaks of white matter were seen at the apex of each pyramid, and running up in the direction of the tubuli.

The appearances exhibited by the right kidney when laid open are shown in Plate III., fig. 4.

Case 2.—J. P., about sixty years of age, a strong-looking man, six feet in height, had been a gouty patient for many years, with deposits upon the cartilages of the ears and around many of the joints, some of considerable size. Death was occasioned by an accident.

Many of the joints were coated with white matter as in the previous case. The kidneys were much contracted, each weighing less than 3 ounces, and exhibiting the deposition of urate of soda upon the end of each cone, and also in the direction of the tubuli.

Case 3.—1852. D. B., aged 54, not inheriting gout, a man of steady habits, who had rarely been intoxicated, but had been much exposed to cold and wet. He was first attacked with gout when 28 years old, in the ball of the left great toe, and has had numerous attacks since that time gradually increasing in severity: the disease was confined for some years to the lower extremities, but subsequently the fingers, hands, and elbows became affected; he first noticed the formation of chalk-stones eight years ago, after an injury to the back of his hand. Both ears are studded with deposits, the wrists enlarged and partially anchylosed, the feet and knees swollen and distorted, the latter flexed and almost immoveable;

numerous sores exist about the diseased joints, giving rise to a discharge of pus mixed with urate of soda.

This patient died worn out with suffering, and exhausted by diarrhœa and gastric disturbance.

The articular surfaces of nearly all the joints were covered with a coating of chalky deposit, and the various ligaments freely sprinkled with it. In addition to the parts more usually found affected, it was noted, on examination of the left hip joint, that the cartilages of the head of the femur and of the cotyloid cavity were also thickly spread over with the same plaster-like matter, and spots of urate of soda, as delineated in Fig. 8, were present in the ligamentum teres. A few minute specks of the same nature were likewise found on the arytenoid cartilage of the larynx; there was some atheromatous deposit about the mitral valve of the heart, but no uric acid was contained in it.

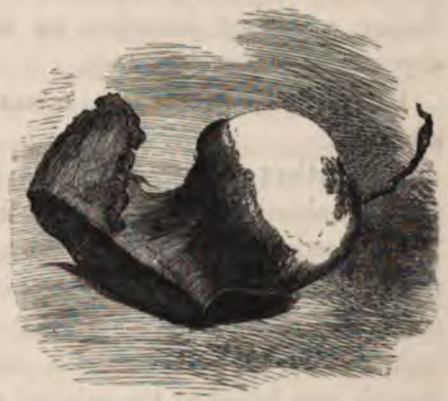


Fig. 8.*

The capsules of the kidneys were adherent, the cortical structure diminished and not easily distinguished from the pyramidal portion; the substance was soft and fatty, some gritty collections were found in the pelvis of the left kidney, where there was also a small uric acid calculus, about the size of a pea.

Case 4.—1855. H. B., aged 48, a musician, father and

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[*] Fig. 8. The head of the femur of D. B., showing the deposition of urate of soda in the cartilage and spots of the same in the ligamentum teres.

mother both subject to gout. For eleven years of his life took one pint of port wine daily, and frequently gin and water. First attack of gout twelve years ago in right great toe; second attack six months afterwards in both knees; in subsequent attacks, which took place at uncertain intervals, the other great toe and both hands, wrists, knees and elbows were affected; there was much distortion of both hands, the fingers were twisted towards the ulna, nearly all the smaller joints enlarged, some producing a grating sensation on movement; no external deposits in ear or elsewhere.

Urine pale, containing a considerable quantity of albumen.

The patient died from an attack of pleuro-pneumonia. On examination, it was found that the metatarso-phalangeal articulations of both great toes were anchylosed, the ligaments around the joints infiltrated with urate of soda, and on forcibly separating the bones, which were united by bony anchylosis, a considerable quantity of deposit was found at the original site of the joint, and in the periosteum around the bone. The first phalangeal joint of the right great toe exhibited only a few specks of deposit; on making a section of the metacarpal bone about one third of an inch from its extremity, it was found infiltrated with chalky material. The synovial fluid of the left knee-joint was transparent, and had a well-marked acid re-action; the articulating surfaces were covered with a white layer and the synovial membrane finely sprinkled; several of the other joints were similarly affected.

Both kidneys were small, the right weighed 2½, the left 3¼ ounces.

The capsules were very adherent, the surface very granular, the cortical substance much wasted, the pyramids reaching nearly to the surface, and numerous white streaks were observed in the direction of the pyramids.

There was some enlargement and fatty disease of the heart.

Case 5.—1859. T. B., a man aged 50, not known to inherit gout. The first attack was 22 years ago, and he has had numerous and severe ones since; for the last four months has suffered much from œdema of the legs and scrotum; urine at times scanty and high coloured, but occasionally very pale and copious.

August, 1860, has had no acute attack of gout for eight months, at present both hands much crippled, many joints anchylosed, some are curved backwards, others are flexed. On nearly all the phalanges there are considerable deposits of urate of soda, some soft, others hard.

Both great toes anchylosed at metacarpo-phalangeal articulation, left toe at second joint also. A few small deposits on ears. Urine contains a very large quantity of albumen.

The patient died with symptoms of general anasarca.

The only joints opened were the left knee-joint, and the middle joint of the right index finger. The lower end of the femur, the end of the tibia, and also the patella were covered with urate deposit, and the synovial membrane and ligaments around the joint sprinkled over as as if dusted with a brush. The middle joint of the right index finger contained about one drachm and a half of mortar-like matter. Where there was no deposit of urate the cartilage was destroyed, and the bone in some places quite denuded. On making a transverse section over the dorsum of the first phalanx of the same finger, the tendon was seen firmly imbedded in urate of soda.

The left kidney weighed four and a half ounces, the surface was very granular and presented numerous cysts containing a glairy fluid; on section the cortical and interpyramidal substance was found deficient in quantity and granular in appearance; in some places the bases of the pyramids were not more than one-twentieth of an inch from the surface. In the pyramids there was a deposit of urate of soda, producing a streaky appearance when section was made in the direction of the pyramids, and a dotted one when cut in the other direction; the right kidney was similar to the left: the amount of deposit in the pyramids was somewhat greater. There was a large quantity of fluid in the pericardium and pleura, with œdema of the lungs, and cardiac hypertrophy.

I have examined several of the smaller joints of other subjects of inveterate gout, which exhibited upon their surfaces evidence of deposition, and have made sections in various directions, which have enabled me to trace the deep-seated origin of the chalk-like matter.

Plate III., fig. 1, represents a horizontal section of a thumb, illustrating the manner in which the deposits take place, and the cause of the stiffening of the joint and subsequent anchylosis. It will be observed that a considerable amount of the chalky matter has been infiltrated into ligamentous structures around the phalangeal joints, which alone must have been sufficient to produce great crippling.

On carefully examining the drawing, it will be seen that the articular surfaces of the cartilages are not adherent or glued together, but that a cavity is seen to exist, the matter being apparently deposited on the free surfaces of the cartilages, and not penetrating their whole thickness: the same appearance is also presented in the phalangeal joints of the fingers in fig. 2 of the same plate, where the disease is advanced to an extreme degree; for here not only are the ligaments around the small joints affected, but deposition has also taken place within the sheaths of the tendons, in the tendons themselves, and on the periosteum, to such an extent as to produce complete rigidity of the finger, and bulging of the deposited matter. Many of the tissues appear to be entirely converted into chalk-like matter, and in fig. 2 it will also be observed, that a small quantity of urate of soda is seen within the substance of the bone of the first phalanx; this is almost the only instance in which I have met with a deposit within the osseous tissue, but even here the deposition appears to be in immediate connection with the matter in the articular cartilage.

As Cruveilhier stated that small cretaceous masses sometimes exist in the substance of the bone itself, quite removed from the cartilage, I have, with a view of testing this point, made numerous sections of bones taken from different gouty subjects, when the surfaces were completely encrusted, but in only two cases was I able to detect the slightest traces of urate of soda.

I consider this a question of importance, having a close relation to the pathology of the disease, believing that deposition can scarcely take place in a very vascular tissue, or, at any rate, in one whose circulation at the time is active. The amount of deposit in the finger (fig. 2) is so extensive that the blood-vessels must have been considerably pressed upon, and probably the circulation in the part was extremely defective, and the cretaceous-looking mass in the metacarpal end of the bone was immediately in contact with the cartilage, which was itself completely infiltrated. I have chemically examined bones where the cartilages were infiltrated, but could never detect a trace of uric acid in their substance.

There are on record some analyses of the bones of subjects of chronic gout, some of whom are stated to have had tophaceous deposits about the joints; one was made by Marchand of the upper part of the femur, and of the radius and ulna of a person with chalk deposits on the knees and elbows. The results of his examination were as follows:—

	Femur.	Radius and Ulna.
Phosphate of lime	42·12	43·18
Carbonate of lime	8·24	8·50
Phosphate of magnesia	1·01	0·99
Animal matter	46·32	45.96
Fluorides of calcium, sodium, chloride of sodium, and loss	2·21	1·37

Lehmann also analysed the bones of three persons with chronic gout; their ages varying from 40 to 50 years. He found:—

	1	2	3
Phosphate of lime	35·16	35·83	37·22
Carbonate of lime	8·41	9·82	8·99
Phosphate of magnesia	1·31	1·05	1·13
Soluble salts	2·93	2·03	1·82
Cartilage	38·14	38·26	40·03
Fat	12·11	13·37	9·15

It will be seen that there was no uric acid in these bones, thus confirming my own observations; the chief difference between gouty and healthy bones appears to consist in the diminished quantity of earthy matter, and the large augmentation of the fat. Although I have not quantitatively determined the amount of fat in the bones of patients who have died from aggravated forms of gout, I am convinced that it often exists in large quantities, but whether this change is related essentially to this disease, or is merely dependent on imperfect nutrition, requires further observations to determine; it seems that other tissues besides the bones are apt in these cases to become the seat of fatty degeneration.

One point in connection with the mode in which deposits take place, pointed out by Dr. W. Budd, and which has a considerable bearing upon the pathology of gout, or at least of its local manifestations, is the fact that urate of soda avoids contiguity with blood-vessels. Dr. Budd states that in the larger cartilages, such as those of the knee-joint, immediately under the synovial membrane, and at the point where this membrane becomes attached to the border of the cartilage, there is a rich network of blood-vessels; from this a series of straight vessels arise, which pass to a certain distance over the free surface of the cartilage, forming loops, which often present considerable dilatations; wherever these vessels extend, the gouty matter is either very scanty or altogether absent. A margin of free cartilage surrounds them on all sides, so that the deposit seems, so to speak, to recede before the blood-vessel. This is clearly shown in Plate III., fig. 3, *a*, where the mode in which the deposit has taken place on the surface of condyles of the femur, is depicted.

All chalk-stones probably have their origin in fibrous or cartilaginous structures, and are never primarily connected with highly vascular tissues, although by increase of growth and the pressure thus induced, they may subsequently appear on the surface; they are first observed externally in parts of the body where these structures approach nearest the surface; as, for example, in the ears, on the palmar surfaces of the tips of the fingers, and in other like situations; it will be seen by reference to the drawing in Plate III., fig. 2, how readily depositions in such parts become visible.

The same remarks especially apply to the white specks so frequently seen on the ear, and which are equally connected with fibro-cartilaginous tissue.

II.—*Examination of subjects of Gout, with no appreciable deformity, and no visible deposits of chalk-stones, except one or more specks on the cartilage of the ear.*

CASE 6.—The subject of the sixth case was a man about 50 years of age; he was tall and strongly made, and had died of some acute disease. There were no appearances of deformity of the joints, the movements of which seemed to be performed with tolerable ease, and with the exception of three small nodules of urate of soda, upon the edge and fold of the helix of the right ear, no other deposits were visible externally.

The ear being more closely examined, the nodules were observed to be attached to the fibro-cartilage, bulging outwards, and separating the integuments; it was exceedingly difficult to detach them from the cartilage, as they appeared to penetrate into the very substance of that tissue. Under the microscope the white matter exhibited the crystalline appearance before alluded to (Plate V., fig. 3), and consisted of urate of soda, united with the elements of the structure in which it was imbedded.

Each kidney was small, under three ounces avoirdupois, and much contracted in size; on section, the cortical matter was found to be very deficient, and many white streaks of urate of soda were seen in the tubules of the pyramids: appearances which will be more fully described further on.

As there was so complete an absence of deformity, and merely the presence of a few nodules upon the ears, it was a matter of considerable interest to ascertain the condition of the joints, in order to discover whether deposits of urate of soda take place upon the ligaments and cartilages of the articulations, when external appearances would not indicate their presence.

The left knee was first examined; there were small patches of deposit upon the surface, and in the substance of the ligamentum patellæ, as likewise in all the other tendinous structures of the joint; in the former these spots were seen on the superficial layer, extending through to the surface of the bone; the patella itself was quite free from this matter, although sought for by making sections of the bone in various directions; the cartilage on the surface of the patella, which is turned inwards and forms part of the articulation, was of considerable thickness, and sprinkled on its surface and throughout its substance with small white points, some of the spots in the interior not being connected with those on the surface. The articular surface of the femur

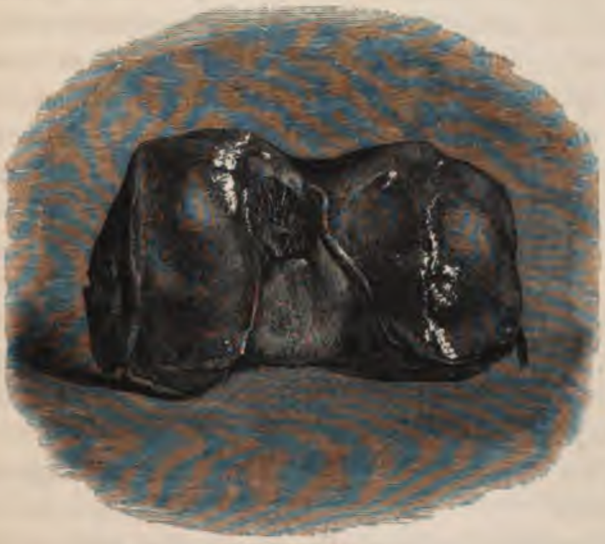

Fig. 9.*

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* Fig. 9 represents the end of the femur, showing the deposition of urate of soda in streaks upon the surface of the condyles. In this case no chalk-stones were visible externally, except two or three small spots on the cartilage of one ear.

was marked on both condyles with a small amount of plastery deposit, apparently smeared in streaks over the surface of the cartilages, as shown in woodcut, fig. 9. The tendons at their point of insertion into the condyles of the femur were also encrusted, especially on the surface corresponding to the small indentations in the condyle of the bone; the semilunar cartilages were freely sprinkled; the anterior and posterior crucial ligaments were whitened externally, and on section, presented in their interior large spots of this deposit. The articular surface of the tibia was streaked in a similar manner to that of the femur, but less extensively; some patches also existed between the tibia and fibula.

The right knee was affected in the same way as the left.

The great toe joint was found to be extensively diseased, the articulating cartilages, as also the surrounding ligaments, being entirely covered, and the urate deposit forming a complete solid case for the joint.

In the upper extremities the following changes were observed.

The anterior and posterior ligaments of one wrist joint which was examined, were sprinkled with a white deposit; a small nodular deposit existed on the external surface of the styloid process of the ulna; the articular cartilage between the radius and ulna was covered with white urate deposit on both surfaces, so also were the articular cartilages corresponding to the wrist joint both on the carpal and radio-ulnar portions; over these surfaces it existed in very much larger quantities than in the knee joints. The fingers were variously affected; in some the sheaths of the tendons were the seat of the deposit, the tendons themselves being completely free; in others, as the index fingers, one joint had the articular cartilage and tendon free, another the surface healthy but the tendon with a very slight deposit on its surface; upon the whole, the tendon and ligaments, especially those around the joints and at the points of insertion into the heads of the phalanges, were more generally affected than the articular cartilages themselves.

The ligaments connecting the carpal bones with one another and also with the metacarpus, and likewise the carpal ends of the metacarpal bones, especially on their dorsal surfaces, appeared to be one mass of chalk-like concretion.

In the carpus all the articular surfaces of the cuneiform, semilunar, and scaphoid bones were covered with a layer of white matter, which penetrated and encrusted the ligaments uniting these bones; the ligament connecting the semilunar with the scaphoid was one mass of this matter; the cartilage on the surface of the cuneiform which articulates with the pisiform bone was also implicated. All the cartilages of the articular surfaces of the unciform, os magnum, trapezium, and trapezoid, and the corresponding surfaces of the first row of carpal bones were more or less covered, those of the unciform and os magnum particularly so. The articulating surfaces of the second row of carpal bones with the metacarpal were still more uniformly and thickly covered, likewise the carpal surfaces of the metacarpal. The sheaths of the flexor tendons, also the tendons themselves, were superficially encrusted, and, in places, the plaster-like matter extended into the substance of the tendon.

The following were the appearances seen in dissecting one of the fingers of this subject, in which the disease had not made great ravages, as some of the cartilages were unaffected and others but partially injured.

The cartilage of the metacarpo-phalangeal joint appeared quite healthy, but at the point of attachment of the lateral ligaments, a small amount of the white deposit was observed on each side.

The surface of the first phalangeal joint was partially covered with a thin layer, but much healthy cartilage was visible, and chalk-like deposit existed in considerable amount at the point of attachment of the lateral ligaments with the bone. The same phenomenon was seen in the second phalangeal joint; the tendons in the finger were found healthy, but many spots of matter were seen upon the sheaths.

Several joints in this subject were perfectly healthy, for example, the hips and shoulders, and the left elbow; but the right elbow joint showed considerable encrustation of the cartilages of the humerus, ulna and radius.

In most of the affected joints there was some thick white synovial fluid, which when put under the glass exhibited a crystalline appearance due to the contained urate of soda. (Plate V., fig. 3.)

CASE 7.—In 1858 I had an opportunity of making an examination of the body of a gouty man, who did not present to ordinary observation any appearance indicating the presence of chalky deposit.

The following is a short history of his case, taken during life. About 44 years of age, stout, of moderate height, with no hereditary predisposition to gout; had always lived well, and drank rather freely of porter, occasionally mixed with gin; had been exposed to some hardships, and been laid up with yellow fever in Spain. The first fit of gout occurred twelve years before his death, in the ball of one great toe, the second a year after in the same locality; since the latter date he had had several attacks in which the ankles, knees, elbows, shoulders, and hips, were affected; his death was very sudden and depended on cardiac disease; the heart after death was found to weigh nearly fourteen ounces, and there was evidence of much fatty degeneration of its tissue.

During life this patient was free from any stiffness or deformity of joints, and no concretions were visible, saving two or three very minute points on the helix of the left ear, none of which were so large as the head of the smallest pin; in fact, so small were they, that only a most minute and special search would have enabled any one to discover their existence. The post mortem inspection gave the following results in reference to the joints.

The surfaces of the bones in the metatarso-phalangeal joint of both great toes were found completely covered as if with white paint; there was also some redness of the synovial membrane. The right knee-joint, which had been recently inflamed, exhibited much vascularity both of the synovial membrane and fringes. The synovial fluid had a distinct acid reaction, and was speckled here and there with white points.

The outer condyle of the femur was streaked with white patches, the inner also, but in a somewhat less degree; that portion of the surface of the condyles in contact with the synovial fringes was free. The articular surface of the patella was irregularly spotted. The head of the tibia was streaked similarly to the femur, and the surface corresponding to the outer condyle had more white deposit than the rest. The fibro-cartilages were found strongly infiltrated, and spots of urate of soda were visible upon the crucial and other ligaments. The synovial membrane throughout the whole joint was finely sprinkled with minute white granules, the nature and structure of which will be described further on.

The left kidney was notched and contracted, and weighed two ounces and a quarter, the removal of the capsule caused some injury to the cortical portion, which was distinctly wasted. At the mamilla of each pyramid white points were observed, and streaks of the white matter seen in the pyramidal portion.

The right kidney weighed three ounces and a quarter, and exhibited the same appearances as the left. The heart was enlarged, some atheromatous deposits were seen on the aortic and mitral valves, and much fat in its muscular fibres.

Case 8.—In 1859 I made the autopsy of a man 57 years of age, who died from the effects of a severe accident. He had suffered previously from about twelve attacks of gout; the early fits were chiefly confined to the great toes, but the latter had implicated the knees, wrists, and hands. With the exception of a single speck of urate of soda about the size of a large pin's head, situated upon the helix of the right ear, no external deposits were visible, and there was an absence of any marked stiffness or deformity. An examination was made of the right hand, which had been seriously injured by the accident, and amputated during life, also of both great toes and knees, and several other articulations. In the metatarso-phalangeal joint of each great toe, the cartilages were completely infiltrated with urate of soda, the surfaces of the sesamoid bones and ligaments exhibiting an appearance resembling fig. 10, but more strongly marked; many of the other joints of the feet were slightly affected; the knees were streaked with the white matter to about the same degree as in fig. 9. Nearly all the surfaces of the carpal and metacarpal bones, as also those of some of the phalangeal joints, were likewise encrusted.

The kidneys were congested and granular, each weighing nearly six ounces avoirdupois, and, on careful examination, white points and streaks of urate of soda were observed at the ends of the pyramids, and in the direction of the tubuli. The urine was strongly albuminous. The deposits in the cartilages, ligaments, synovial membranes, and kidneys, on microscopical examination exhibited a crystalline appearance.

III.—*Examination of subjects of Gout, in whom no trace of chalky matter was externally visible.*

Case 9.—J. S., a male subject, about 52 years of age, with whose previous history I am unacquainted. The body presented no deformity and there was an absence of rigidity of joints, except of the metatarso-phalangeal articulation of the right great toe; not the slightest appearance of chalky deposit even on the ears was visible, although carefully sought for. The joints of the upper extremities were found on examination to be healthy, even the smaller articulations of the carpus, metacarpus, and phalanges; the same was the case with the hip joints, but in the knees the articular cartilages of the femur, tibia, and patella, were freely encrusted with urate of soda, as also almost all the bones of the tarsus and metatarsus, and some of the phalangeal articulations. The ball of the right great toe was anchylosed by the large amount of deposit in the surrounding ligaments, and a mass of considerable size was found to penetrate into the substance of the first phalanx. The astragalus, os calcis, tibia, and femur, exhibited no appearance of this matter in their structure, but the tissue was soft from fatty degeneration.

The synovial fluid appeared healthy, no crystals were visible in it, but the membrane of the knee-joints showed a fine sprinkling of white points. Some of the toes were carefully examined, in order to ascertain the exact point where deposition first takes place in the joints; in no case was it observed in the ligaments where the articular surface was not also implicated. The kidneys were small and shrivelled; each weighed three ounces avoirdupois, and the removal of the capsule caused injury to the cortical portion, which had become wasted. At the apex of each cone white urate points were observed, and streaks of the same matter were seen to radiate in the direction of the tubuli.

Case 10.—I am indebted to my friend Mr. J. Clover for the following observations, which were particularly valuable to me, being the first made on a gouty subject who presented no deformity or external deposits of chalky matter.

J. T., a gentleman aged 75, who had suffered from gouty attacks for thirty years, but in whom the disorder had never assumed a chronic form, nor induced either stiffness of joints or other appreciable injury. At the time I saw him he was suffering from obstinate diarrhœa, which caused fatal exhaustion. Permission was given to examine one great toe, and the metatarso-phalangeal joint was found much diseased, spots of chalky matter being seen on the external surface of the ligaments and in the groove of the peroneus longus muscle; when the joint was opened, the rounded head of the metatarsal bone, and the cup-like extremity of the phalanx, as also the sesamoid bones, were discovered to be much encrusted. The surface of the metatarsal bone, articulating with the internal cuneiform, was healthy, as also the pulley-like end of the first phalanx. The synovial fluid was somewhat thick, alkaline in re-action, and the synovial membrane studded with minute white specks of urate of soda.

Case 11.—W. J., a gentleman, aged 49, a surgeon by profession, not inheriting gout, but who had evidently acquired the disease by free living. The first fit occurred about thirteen years before his death, and was confined to the ball of one great toe; in the second attack one of his knees was affected as well as the great toe; he had suffered altogether from eight attacks, but had not had any during the last eighteen months; once only did the disease extend to the upper extremities, and then a single joint of one of the fingers became implicated. About six months before his death he began to suffer from symptoms of hepatic disease and afterwards from ascites, for which latter he was tapped. His death resulted from the diarrhœa and exhaustion which followed the operation.

During life he was not troubled with stiffness or deformity of any joint, and not the slightest appearance of urate deposit was seen either upon the ears or elsewhere; in fact he did not consider himself a very gouty subject. No trace of albumen was present in the urine.

On post mortem examination, the liver was found contracted, the capsule thickened, and the surface of the organ somewhat uneven. On section, the structure was seen to be coarsely granular. There was some hypertrophy of the left ventricle of the heart, and atheromatous deposits on the aortic semi-lunar valves.

Examination of Joints.—In the left great toe the head of the metatarsal bone was seen sprinkled with deposits of urate of soda, as was also the cup-shaped end of the first phalanx; white patches were likewise seen on the articulating surfaces of the sesamoid bones, and the ligament had a few spots upon its internal surface. These appearances are depicted in fig. 10.

The ball of the right great toe was similarly affected, and in about the same degree. The synovial fluid in both joints was distinctly alkaline in re-action and normal in appearance.

The heads of the femur and tibia and the articulating surface of the patella of both knees were pretty freely sprinkled with white patches, and points of the same could be seen upon the synovial membrane throughout the joints.

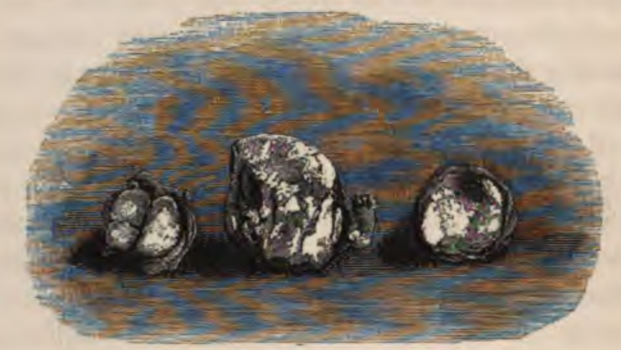

Fig. 10.*

The kidneys exhibited the peculiar phenomena so commonly seen in this disease, although, I believe, never before ascertained to be present in subjects who had only suffered from a few attacks of acute gout.

Case 12.—May, 1859. A man 37 years of age, a butcher by trade and not inheriting gout, but had suffered from it for ten years, first in the great toes and afterwards in the ankles, knees, and wrists; of late as many as three or four attacks occurred annually; for some time he had suffered from much difficulty of breathing, and the urine was albuminous; he died from peritonitis. For the last six months he had not been troubled with gout.

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* Fig. 10 represents the appearance of the articulating surfaces of the bones of the ball of the left great toe of W. J., in whom only eight attacks of gout had ever occurred; no trace of deposits was seen externally, and no appreciable stiffness of the joints or deformity existed.

Not the slightest trace of external deposits of urate of soda was observed, not even a speck on the ears, nor was there any deformity or stiffness of the joints. On opening the metatarso-phalangeal joints of each great toe, the cartilages of the bones, including the sesamoid, were found much encrusted with a white deposit of urate of soda, some white matter also was seen in the ligamentous structures. The phalangeal joints were perfectly free from the disease.

A very slight streaking was observed in the right knee-joint, and on the condyles of the femur and surface of the tibia, but none in the right elbow; the other articulations were not examined.

The left kidney was short and thick, capsule very opaque and adherent, and, on attempting to remove it, the surface of the cortical substance was much injured, and exhibited a granular appearance. Weight, five ounces avoirdupois.

The right kidney similar in appearance to the left, but with a large cyst on its surface, extending into the cortical structure. At the end of the pyramids of both kidneys white points were observed, and many streaks along the course of the tubuli uriniferi; the points and streaks exhibited a crystalline structure under the microscope and were composed of urate of soda.

Case 13.—August, 1859. J. S., a man aged 59, who died from the effects of an accident. The circumstances connected with the case were as follows:—He was thrown down by a cab, which caused some injury to the right knee, and a bruise of a slighter character in the left foot. Gangrene occurred in the right leg, which made it necessary to have recourse to amputation of the thigh; the stump became affected in a similar manner, and the patient soon died from exhaustion. From the history of the case obtained from his wife, it appeared that he had been subject to occasional attacks of gout for the last ten years, affecting principally the great toes and ankles, and now and then a joint of the upper extremities. He had also experienced one slight attack in the left knee.

The pathological appearances discovered after death, as far as the gouty affection was concerned, were as follows:—

The cartilages on the head of the metatarsal bone and first phalanx of the right great toe were encrusted with urate of soda over more than half the extent of their surfaces, and some deposit was present on the sesamoid bones; specks of the same matter were likewise seen on the inner surfaces of the ligaments. The left great toe was similarly affected, but in a slighter degree, and the ankle bones of the same side exhibited white patches of the salt; no trace of deposit was found in the right knee-joint. As it had been previously ascertained that the patient had experienced *one slight attack* of gout in the left knee, it became a matter of extreme interest to observe the condition of this joint, and ascertain whether any morbid appearances remained from this attack, which had occurred some years previously. No deposit was observed on the surfaces of the tibia articulating with the condyles of the femur, the inner condyle of the latter bone was likewise free, but on the anterior portion of the outer condyle a small patch was seen, not exceeding a sixth of an inch in breadth, and about half an inch in length, the deposit gradually becoming less dense from before backwards; in the notch between the condyles a very small spot was likewise seen; a speck about the size of a peppercorn was found near the tuberosity on the outer side of the external condyle, connected with the lateral ligaments. A considerable amount of urate of soda was seen on the articulating surface of the patella, being almost entirely confined to the outer half; a portion of this was very superficial, but some was deep-seated in the cartilage, approaching close to the osseous tissue. In the ligamentous structures upon the outer surface of the patella, minute specks of the same salt were visible; these appearances are delineated in fig. 11. The only other morbid characters presented by the joint were a few scattered and very small white points upon the under surface of the internal semi-lunar cartilage, too minute to be exhibited in a woodcut; the crucial ligaments were quite free.

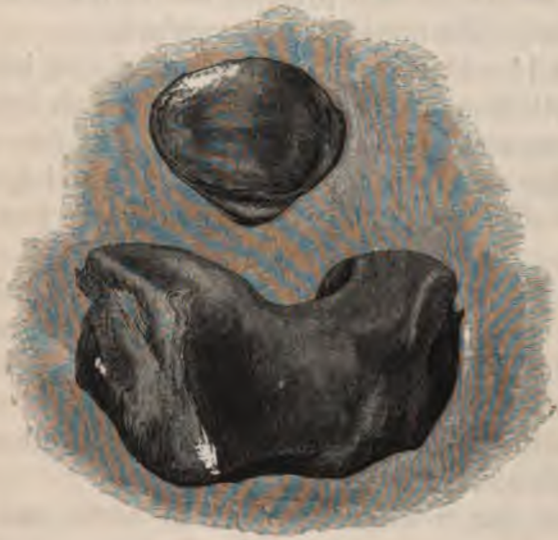

Fig. 11.*

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* Fig. 11. A knee-joint, showing the deposition of urate of soda resulting from one slight attack of gout in that joint.

Both kidneys were small and pale; the right weighed three ounces, the left two ounces and three-quarters. On removing the capsules, the surface presented a granular appearance, and on section, the cortical substance was found to be wasted. A deposit of crystalline urate of soda in the form of spots and streaks was seen at the mamilla of each pyramid, and in the direction of the tubuli. The urine was not examined.

Case 14.—C. H., a man 50 years of age, inheriting gout both from father's and mother's side; his habits had been temperate, he had an attack of gout four or five years ago in the ball of one great toe, and again six months afterwards, but never had more than four or five attacks.

This patient had suffered for the last six months from dropsy consequent on cardiac disease, from the effects of which he gradually died.

On section there was found much deposit of urate of soda in the balls of both great toes, but no other joints were affected.

There was much disease of the aortic and mitral valves, with considerable cardiac hypertrophy; the kidneys appeared healthy.

IV. *Examination of a subject in whom only the ball of the right great toe had been affected with gouty inflammation.*

Case 15.—R. R., a man aged 50, with no known hereditary predisposition to gout; during the last ten years he had suffered much from palpitation and difficulty of breathing, symptoms depending on the presence of hypertrophy and valvular disease of the heart; he had also been much troubled with cough; he had always lived well, and had drunk freely of malt liquors. Three years and a half before his death a distinct fit of gout occurred in the ball of the right great toe, of moderate severity; and a year afterwards a second fit in exactly the same situation; in neither attack were other joints implicated. From the time of the second attack until his death he had not the slightest return of gout. No albumen was present in the urine. A post-mortem examination revealed considerable cardiac disease, the heart weighing twenty-six ounces avoirdupois; the walls of the left ventricle were much thickened and the aortic valves covered with excrescences, and altogether inefficient; the kidneys, weighing six and seven ounces respectively, were apparently healthy, with the exception of a large cyst in the right. The metatarso-phalangeal articulation or ball of the right great toe, the only joint ever inflamed, exhibited the following appearances when opened:—A moderate amount of synovial fluid was present, healthy in appearance, and distinctly alkaline in re-action. A large white patch was seen on the head of the metatarsal bone, occupying about one-tenth of the whole surface, and when carefully examined was found to consist of several minute patches aggregated together; on the surface of the cup-like end of the phalangeal bone more of this white matter was observed, occupying perhaps as much as one-fourth of the cavity; the deposit was not dense, and did not appear to cause any elevation of the surface. The articulating surfaces of the sesamoid bones were free. These appearances are represented in fig. 12 (1).

Besides these deposits, it will be observed that there was a very distinct sprinkling of the same substance upon the inner surface of the ligaments.

The corresponding joint of the left great toe was healthy, as also the phalangeal joints of both feet, and several other joints of the body which were examined. Fig. 12 (²) exhibits the appearance of the cup end of the first phalanx of the healthy toe. The deposit shown in the drawing was examined microscopically and chemically, and found to be identical both in form and composition with that constantly found in this disease, and which will be fully described in the next chapter.

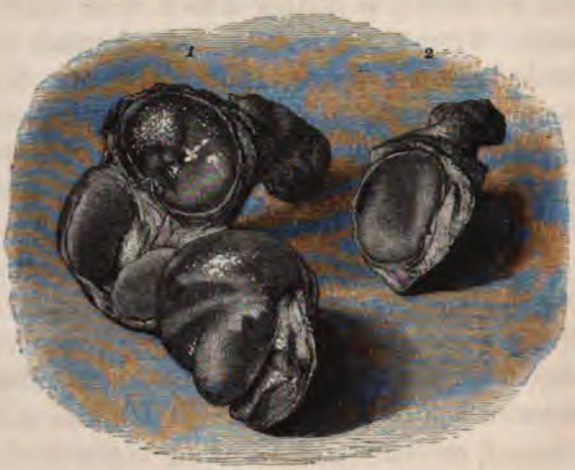

Fig. 12.*

V. *Examination of a subject in whom but a single attack of gout had occurred, and that thirteen years before death.*

Case 16.—E. R., an ostler and coachman, aged 45, had always lived well and never taken more than four or five pints of porter daily; did not inherit gout from either parent.

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* Fig. 12 (¹). Drawn from the ball of the right great toe of R. R., a patient who only experienced two slight attacks of gout, both confined to the joint in question.

Fig. 12 (²) represents the appearance of the end of phalangeal bone of the corresponding joint of the left great toe, in which no trace of urate of soda existed.

About thirteen years ago had an attack of gout in the right great toe, which lasted for about a fortnight and was severe; with this exception he had always enjoyed good health, and has never had a return of the gout.

He died from cardiac disease accompanied with hæmoptysis and pulmonary apoplexy.

The metatarso-phalangeal joint of the right great toe was found much encrusted with white patches of urate of soda, the cups of the phalanx being more than three-fourths covered, the head of the metatarsal bone less so; on the phalangeal joint of the same toe a few white spots were also seen: these appearances are accurately depicted in fig. 13.

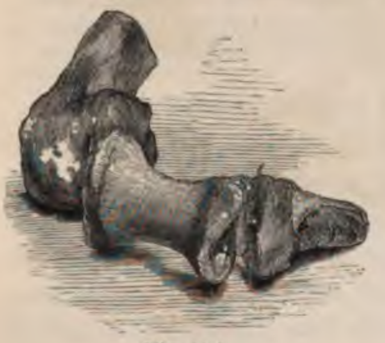

Fig. 13.*

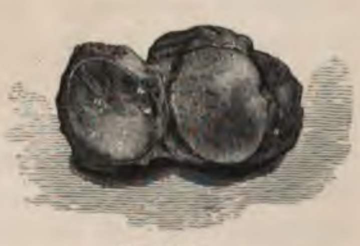

Fig. 14.†

The patient had only spoken of the gout as affecting the right great toe, and he particularly remarked on the intensity of the pain in that part; however, on opening the first joint of the left great toe a few specks were seen; and one minute point in the phalangeal joint; the appearance in the former joint is delineated in fig. 14. The knees contained no trace of deposit, nor was any discovered in any other joint inspected.

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* Fig. 13. A drawing from the right great toe of E. R., a man who had but a single attack of gout 13 years before death.

† Fig. 14. The metatarso-phalangeal joint of left great toe, from the same man from whom fig. 13 was drawn.

The kidneys were congested, weighing 6½ ounces each, and no white points or streaks were observed in them.

CHAPTER VII.

MORBID ANATOMY OF GOUT CONTINUED :—DEDUCTIONS DRAWN FROM THE CASES RELATED IN THE LAST CHAPTER—PROOFS OF THE INVARIABLE DEPOSITION OF CHALKY MATTER IN THE INFLAMMATION OF TRUE GOUT —MICROSCOPIC AND CHEMICAL CHARACTERS OF GOUTY DEPOSITS IN DIFFERENT STRUCTURES—IN ARTICULAR CARTILAGE—SYNOVIAL MEMBRANE—FIBROUS TISSUE—ANCHYLOSIS OF GREAT TOE—CHANGES IN THE KIDNEYS OF GOUTY SUBJECTS : 1. IN THE CHRONIC FORMS OF THE MALADY ; 2. IN THE EARLY STAGES—DEPOSITS IN OTHER SITUATIONS—MORBID ANATOMY OF LOWER ANIMALS IN RELATION TO URIC ACID.

FROM an investigation of the phenomena brought to light in the last chapter, more especially with regard to cases of gout in which no appreciable deformity or rigidity of joints existed during life, some very important deductions may be drawn; deductions which cannot fail to exercise a strong influence upon our views of the intimate nature of the disease, and which we shall now endeavour to explain.

In the examination of the first class of cases—namely, subjects of chronic gout, with extensive chalkstones—the results of my observations, as far as the appearances to the naked eye are concerned, have already been sufficiently detailed; such, for instance, as the more or less complete encrustation of the surfaces of the bones with urate of soda, the infiltration of the surrounding ligaments, deposits within the tendons and their sheaths, and occasionally along the tendinous expansions of the muscles; and Dr. Charcot has found it even in the sheaths of nerves. After a time, when the secretion of urate of soda into the tissues increases, neighbouring parts are pressed upon, atrophied, and absorbed and the deposited matter slowly approaches the surface, usually in a semi-fluid form at first, but gradually becoming solid and chalk-like from the absorption of its more fluid portion. When there is only an integument covering the cartilage, as in the case of the helix of the ear, the deposit makes its appearance at the surface soon after its secretion, but when many other structures are interposed, a considerable time elapses before this occurs, and the deposited matter may undergo considerable hardening from absorption. The only point in which my observations differ from those of Cruveilhier has reference to the occurrence of the deposit within the substance of the bones altogether independently of the cartilage. Cruveilhier found it in the astragalus, os calcis, and patella; I have frequently searched in these situations, but have never seen it except in direct connection with the cartilage, although in some of the phalanges it had penetrated to a considerable depth, and the osseous tissue had become much pressed upon and atrophied.

In the second class of cases, when no appreciable deformity was present during life, and no chalkstones except one or two on the cartilage of the ears, the examination brought to light the fact, unknown, I believe, before, that extensive deposits may take place within the joints without corresponding external manifestation; and also suggested the probability that a close relation exists between the presence of the deposit and the occurrence of true gouty inflammation; for in Case 6 the joints less commonly implicated were free from deposit, as both hip and shoulder-joints, and one elbow, whereas the joints more frequently affected with gout were found encrusted. As the history of the case was unknown, there were no means of positively ascertaining which joints had been inflamed during life.

In the third class, when not a trace of external deposit was perceptible, it was likewise demonstrated that the cartilages and other structures of the joints may be infiltrated with urate of soda.

In Case 10 one great toe only was examined, and here the interesting fact was elicited, that the articular cartilages of the metatarso-phalangeal joint may be completely encrusted, the surrounding ligamentous tissues freely sprinkled, and still the articulating surface of the metatarsal bone with the tarsus, and likewise the phalangeal joint, remain free from disease; this I have seen in other instances, and it exemplifies the great tendency of gout to select one joint in preference to others.

In Case 9 many joints of the lower extremities were affected, but there was complete freedom of the upper limbs and hip joints; thus pointing to the same conclusions as Case 6, but in a still more marked degree.

By Case 11 we are enabled to confirm in a remarkable manner the conclusions to which the foregoing cases point. The history was well known; the patient had been a medical man, and could give the details with accuracy, and it was positively ascertained that he had experienced but eight fits of gout, and these had been spread over a period of thirteen years; once only was a finger affected, the remaining attacks being confined to the great toes, feet, and knees. In this case the examination showed an encrustation of all the joints known to have been implicated, and freedom of the rest, and thus proved almost to demonstration that gouty inflammation is invariably accompanied with deposition of urate of soda.

In Case 15 this fact was proved beyond all reasonable doubt, for the patient had only experienced the disease in a single joint, the ball of one great toe, and even in this it had not been severe; still the surfaces of the metatarsal bone and phalanx were sprinkled over in a marked degree, and a spot was likewise observed on the ligament.

Cases 13 and 16, however, establish the fact absolutely. In Case 13 evidence was obtained during life that the left knee had been only once affected with gout, and then very slightly, the right knee having been always quite free from the disease; the post-mortem examination demonstrated a slight deposit in the structures of the left knee, but none in the right; and, lastly, in Case 16, the result of a *single* fit of gout was characteristically revealed.

After this evidence, how is it possible to doubt that *gouty inflammation is invariably attended with the deposition of urate of soda?*

The other morbid appearances seen in joints affected with gout are comparatively unimportant, being similar to those observed after other forms of inflammation, as redness, thickening, and dryness of the synovial membrane, and occasionally effused fluid; but these phenomena vary much according to the time which has elapsed since the commencement of the attack.

The establishment of the fact that gouty inflammation is invariably accompanied with the deposition of a peculiar salt is of the highest importance, inasmuch as it proves the inflammation to have a specific character, and to differ entirely from the various other morbid affections of the joints with which it has hitherto been confounded.

I may add here that although I have made many examinations of the joints of the subjects of different articular diseases, in no other affection have I ever detected this deposition on the cartilages or elsewhere. It never occurs in acute or chronic forms of rheumatism, nor in rheumatoid arthritis, the disease commonly known by the name of chronic rheumatic arthritis, although alterations of a still more serious nature are frequently met with in this last affection.

I am of opinion that not only is the deposition of urate of soda constantly found in gouty inflammation, but that it stands to it in the relation of cause rather than effect, that is to say, the deposition of the salt first takes place in the synovial membranes, cartilages, and tendinous structures of the joints, and by its presence gives rise to inflammatory action. Many arguments might be adduced in support of this statement, which we shall have an opportunity of more freely discussing in a future chapter; I may, however, allude here to two circumstances strongly favouring the above view; namely, that when deposition occurs in parts of low vitality, as in the fibro-cartilages of the ears, there is comparatively little inflammation, although often sufficient to call forth the attention of the patient; and again, when inflammation runs high, destruction of the urate of soda to some extent results, as proved by the absence of uric acid in the blister serum of the inflamed part.

Microscopic and chemical characters of gouty deposits in different structures.—We have spoken of the white plaster-like matter as occurring upon the cartilages, in the tendons, and other parts, without particular reference either to its minute characters or chemical composition; to these points it is incumbent upon us now to direct our attention. In the description already given of the morbid appearances, we have seen that the chalky deposit has been sometimes stated to replace the cartilage supposed to have become absorbed, sometimes to have been spread over its surface in the form of a thin layer, the cartilage remaining intact; both these statements are erroneous, for as we proceed in our inquiries we shall find that the white deposit is altogether interstitial in character.

In a communication on Gout published in the Transactions of the Royal Medical and Chirurgical Society, 1848, I gave a drawing of articular cartilage taken from the metatarsal bone of a gouty patient, whose foot had been amputated by the late Mr. Liston, and it was there shown that the white deposit was entirely crystalline, consisting of minute needles of urate of soda, arranged in the manner exhibited in Plate V., fig. 2.

Subsequently I exhibited a specimen at a meeting of the Pathological Society, proving that the deposit was not on the free surface of the cartilage, but that a thin organic layer could often be demonstrated external to it. Since this period Dr. W. Budd examined the structure of such cartilage, and the results of his investigations are published in the Medical and Chirurgical Transactions for 1855.

If we make a thin vertical section of a piece of cartilage containing this deposit, that is, a section cut from the free surface in the direction of the bone, we at once discover that the matter ordinarily extends to a comparatively small depth into the substance, seldom penetrating beyond two-thirds of its thickness, often much less, and it will also be seen that this deposit presents a beautifully crystalline appearance, as seen in Plate V., fig. 1. The phenomenon can be well observed when we examine the specimen with a linear magnifying power of from 100 to 200, either by transmitted or reflected light, and still more satisfactorily by the aid of polarised light. Dr. Budd, in the paper above alluded to, states that the foreign matter takes two distinct forms, in some situations being granular or amorphous, in others perfectly crystalline. I have made some hundred sections of cartilage taken from different gouty subjects, and from various joints, and although the matter has at first occasionally presented the granular form, yet further examination, more especially by the aid of the polariscope, has always shown it to consist of minute crystals, the amorphous appearance having been due to the direction of the needles, and not to any want of crystallisation. In the drawing, Plate V., fig. 1, the thin membranous layer external to the deposit will be observed, a phenomenon which has also been described by Dr. Budd in the communication before alluded to. In Plate V., fig. 2, a horizontal section of the cartilage is shown; the crystals, however, are seldom met with so symmetrically arranged.

The density of the deposit is always found to be greatest at the surface, gradually becoming less as it penetrates into the structure. In bones which are only moderately sprinkled, the penetration does not often exceed one-third of the whole thickness, or at least the crystals become so few and fine that they are not visible beyond this depth unless great precautions are adopted, but sometimes upon the end of bones which have long been the seat of the disease, the entire thickness of the cartilage seems to be implicated. The appearance presented by a thin vertical section when seen under polarised light, is represented in fig. 15, the fine prismatic needles are observed to penetrate to some considerable depth: near the surface the light is intense from the interlacement of innumerable crystals. When properly exhibited as an opaque object it is also very beautiful.

In order to determine the intimate nature of the deposit within the cartilage, we have only to take thin slices of it, wash them with cold water and afterwards with alcohol, for the purpose of removing any matters readily soluble in such menstrua, then digest in warm water, under 200° Fahr., until the cartilage has become transparent; the watery solution, after evaporation and cooling, will deposit beautiful tufts of crystals (Fig. 16), which can be readily demonstrated to consist of pure urate of soda, as a soluble alkaline ash is left, after incineration, consisting of carbonate of soda, and the crystals dissolved in water, and treated with acetic acid, give rise to uric acid in its characteristic rhombic forms. If the crystals be treated with dilute nitric acid on a piece of white porcelain, and, when almost dry, held over a solution of ammonia, they give rise to a brilliant purple appearance from the production of murexide. By these reactions, as well as from the forms in which the salt crystallises, it can be demonstrated, that the matter giving the white opacity to the cartilage consists solely of urate of soda.

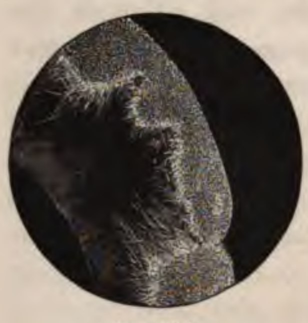

Fig. 15.[*]

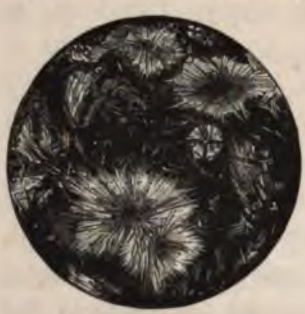

Fig. 16.[*]

When the extremity of a bone completely and thickly coated with urate of soda, is digested in warm water for some days, the whole of the deposit is removed, and it then presents an almost healthy appearance, being left completely covered with cartilage. In some of my experiments I should have been unable to determine whether it had been previously diseased, for the only difference which I have observed, has been a somewhat uneven surface and a transparent and spongy appearance of the cartilage on drying. To ascertain this point without risk of error, I have taken the end of two bones from the same individual, and subjected them to similar influences, either to water at the temperature of 100° Fahr., or to the action of a weak solution of the carbonate of some alkali. Fig. 17 shows the appearance of two metacarpal bones, one encrusted with the deposit, the

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[*] Fig. 15. The appearance presented by a very thin vertical section of gouty cartilage: the matter is seen to be most dense at the free surface, and gradually to become thinner as it penetrates into the structure. From a specimen preserved in Canada balsam. Linear magnifying power 220. Polarised light.

[†] Fig. 16 represents the crystallisation of urate of soda from the watery solution in which gouty cartilage had been digested, seen under polarised light. Linear magnifying power 220.

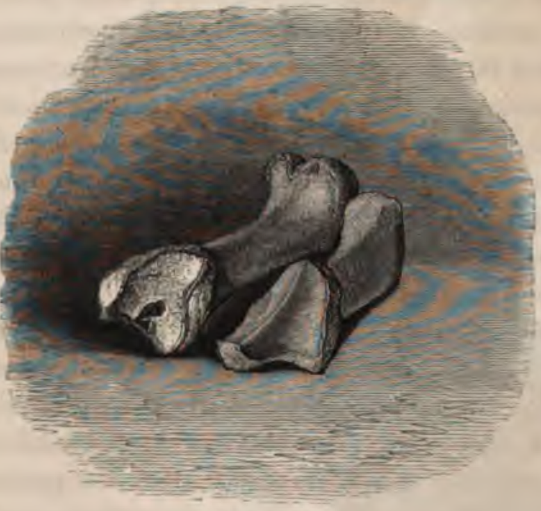

Fig. 17.*

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* Fig. 17 represents the ends of two metacarpal bones, one encrusted with urate of soda, the other freed from the deposit by the action of warm water, and exhibiting the cartilage apparently healthy in structure.

other freed from it by the long continued action of warm water: the latter was, if anything, more thickly covered than the former before the commencement of the experiment. These observations prove beyond doubt, that the idea of the supposed absorption of the cartilage, and the after superposition of a layer of foreign matter, is erroneous, and that the deposition is entirely interstitial in its nature. If thin layers of gouty cartilage are submitted to the action of warm water for some hours, the deposited matter will be gradually dissolved until at length it is quite removed, after which the cartilage will be found to have recovered its healthy structure. By such a mode of proceeding, watching the specimens in the different stages, much light will be thrown upon the mode in which the deposition has originally taken place. In some specimens I have noticed, that after much of the urate of soda has been removed by the water, rhombic crystals of uric acid have been left within the cartilage; it is however probable, that the reduction of the acid is only a post-mortem effect from the generation of another acid by decomposition. In almost every case I have observed, that as the solution of the urate of soda proceeds, the deposit assumes the appearance of small masses of crystals separated from each other by clear interspaces, and after the further action of the water, such masses have often appeared to occupy the situation of the nucleus cells of the tissue (Plate V., fig. 1).

In detailing the post-mortem examinations of the joints of gouty subjects, we stated that the synovial fluid was occasionally of a thick consistence, and more or less opaque, sometimes studded with little white points; when examined by the microscope, it is found to be crystalline, exhibiting fine needles, or prisms, usually aggregated together in the form of bundles. The crystals are soluble in warm water, the solutions yielding the characteristic murexide test, and on the addition of an acid, depositing rhombic crystals of uric acid: in short, the opaque matter within the synovial fluid is proved to be urate of soda, the same salt that exists within the cartilaginous structure; in some of the more chronic forms of gout, masses of white matter have been found; this, however, does not commonly happen, and even in joints very considerably affected, the cavities often remain free from deposit, although white points may be visible in the synovial fluid.

In speaking of the dissections of the larger articulations, and more especially the knee-joint, very minute white points have been mentioned as occurring upon the synovial membrane; if a portion of this tissue be removed, and placed under the microscope with a low magnifying power, about 60 linear, with the use of polarised light, an appearance represented in Fig. 18 (1) is observed, showing the studding of the membrane with small white masses, arranged at somewhat equal distances from each other. When a very minute mass is selected and subjected to a higher power, about 220 linear, the crystalline structure becomes apparent, especially if a little pressure be used upon the thin upper glass covering the membrane, by which means the globular mass becomes flattened and the needles of urate

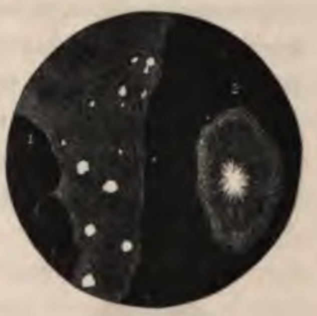

Fig. 18.*

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* Fig. 18. A drawing from a small piece of synovial membrane from the knee-joint, under polarised light. (1.) Shows the appearance with a magnifying power of 60 linear. (2.) One of the smaller points with a magnifying power of 220 linear, exhibiting the crystalline structure.

of soda rendered more evident; this is represented in Fig. 18 (2). When the membrane is submitted to the long continued action of warm water, the masses are gradually dissolved, and the tissue left in an apparently normal state.

Ligamentous and fibro-cartilaginous tissues, tendons and their sheaths, when encrusted with urate of soda, present under the miscroscope appearances very similar to those of articular cartilage, although it frequently happens that the crystalline structure in the former is not so regular as in the latter or in the synovial membrane. I may here remark, in concluding this part of the subject, that in whatever tissue or situation urate of soda is deposited, it invariably exhibits a crystalline appearance, although sometimes the prisms are exceedingly small, requiring high magnifying powers and the use of polarised light to define them very clearly.

In describing the mischievous consequences arising from acute gout, it was remarked that permanent stiffness or complete anchylosis of the first joint of the great toe might occur after only a few attacks. On two occasions I had the opportunity of ascertaining the exact condition of the parts thus injured; in one case, on making a perpendicular section of the bones, the appearance which is represented in fig. 19, was seen. It will be observed that the curved white line, indicating the position of the joint, is broken at intervals,

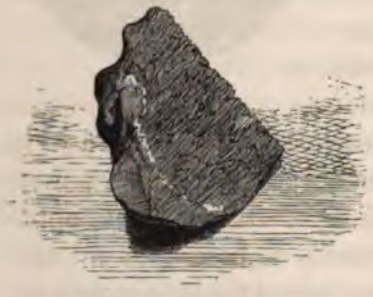

Fig. 19.*

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* Fig. 19 represents a perpendicular section of the first joint of a great toe which had become anchylosed after a few attacks of gout.

as if, subsequent to the deposition of the urate of soda, the bony structure of the cup of the phalanx had given way, and the head of the metatarsal bone had been forcibly thrust into it; in Case 4, this change had proceeded much further, as will be seen from the description given in Chapter VI. Further on, when discussing the nature of gout, we shall have to notice the liability of this joint to injury, even in individuals not suffering from any articular affection, and this will probably explain the cause of its frequent stiffness in gout.

Changes in the kidneys of gouty Subjects.—It has long been a prevalent idea that some connection exists between gout and kidney disease, an opinion probably derived from the notion that gout and gravel are often seen together, and strengthened by the fact that the most common constituent of stone and gravel is almost identical with the chalky deposits of gout. It is a fact that gout and gravel are frequently met with in the same patient, now and then at the same time, but more commonly at different periods of life; those who in youth were subject to the latter, in middle life and old age frequently suffering from the former.

Some years since Dr. Todd drew the attention of the profession to a condition of the kidney which frequently occurs in cases of inveterate chronic gout, but I believe no one had studied the subject of the changes in the acute form of the disease before my observations in 1849, which were incorporated in the first edition of the present work. I was then enabled to speak more positively upon this subject, and to show that even in the slighter forms and early stages of gout, the renal organs sometimes become seriously implicated.

The so-called gouty kidney of Dr. Todd occurs in advanced gout, and in chronic desquamative nephritis, and has the following characters. It is usually much contracted, often not more than one-half or one-third the natural size, with a shrivelled appearance, the capsules thickened and opaque, and the surface granular. On section it is found that the decrease is chiefly at the expense of the cortical portion, which is sometimes so reduced that the pyramids almost reach the surface of the organ.

In 1849, when examining the kidney of a gouty man, who had died from some other disease, I observed that not only had it the characters above described, but that white streaks existed chiefly in the direction of the tubes of the pyramidal portion, though some were to be found in the cortical part; the mamilla of each cone also presented the appearance of little white points, from deposition in this situation. Dr. Todd in his lectures on urinary diseases, mentions this fact, and gives an account of the post-mortem examination of a gouty patient who died from cholera, where the phenomenon was observed by Mr. Ceeley.*

The external features presented by the kidney in this form of gout resemble those of an ordinary shrivelled kidney, and the appearance when a section is made is shown in Plate III, fig. 4, where the white points and lines as well as the contracted state of the whole organ, are distinctly marked.

When the white matter is placed under the microscope, it is found to be crystalline in structure, consisting of urate of soda in the form of prisms as represented in the accompanying woodcut. (Fig. 20.) When the crystals are chemically tested, they are at once shown to consist of urate of soda, and to be identical with the matter which forms the essential part of chalk-stones, and produces the alteration in articular cartilages, as they are soluble to some extent in hot water, yield the murexide test when heated with nitric acid and ammonia, and afford crystalline rhombs of uric acid on the addition of a stronger acid.

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* Dr. Charcot states that these white streaks were observed and described by M. de Castelnau in 1843.

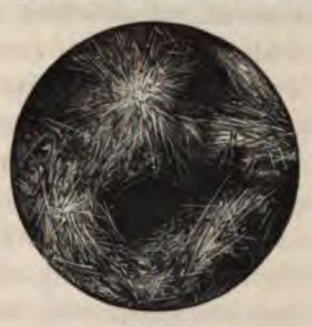

Fig. 20.*

The phenomenon just alluded to, as well as the contracted state of the organ, I have now frequently observed—in fact in all cases of chronic chalk-gout where the opportunity of making an examination has been afforded, and of which many examples have been recorded in the last chapter; it will there be seen that the kidneys have seldom been found to weigh more than 3¼, and sometimes have weighed as little as 2½ ounces.†

The contracted state of the kidneys in gout had been noticed long since, though no stress was laid upon the point until within the last few years. Mr. Henry Watson, in 1782, when describing an autopsy before referred to, speaks of the kidneys as small, and filled with hydatids (? cysts), and of the outer surface of the right kidney as covered with little bladders; in most of the early post-mortem examinations of gouty subjects, no mention is made of the condition of these organs.

The question now arises, is not the same state of kidney found in other diseases besides gout? As far as the contracted or atrophied condition of the organ is concerned it must be answered in the affirmative, for it is an alteration which not unfrequently occurs in cases of albuminuria. A condition of urine likewise exists in many cases of granular disease and chronic desquamative nephritis, similar to that found in the severe forms of chalky gout, both as regards the ordinary physical qualities, as the low specific gravity, pale colour, and presence of albumen; and also with respect to the occurrence of granular and waxy casts; but I know of no published observations showing the presence of the white streaks of urate of soda in any other disease than gout. I have paid considerable attention to this point, and, aided by Dr. W. Hickman, obtained the results of the examination of these organs, in twenty-three consecutive autopsies. The examinations were made on subjects who had died from various diseases; in one who had suffered from gout, the white streaks in the kidneys were found, and likewise deposits of urate of soda in the joints; in nineteen out of twenty-two remaining cases, no deposits of urate of soda were discovered, but fatty matter was occasionally observed among the tubes; in three, however, in whose joints no evidence of gouty deposit was visible, crystals were seen in the kidneys, some composed of uric acid, others of urate of soda, but all of them situated within the tubes, and much larger than those observed in cases of gout, where, as I have before remarked, much of the deposit appears to be interstitial, that is, within the fibrous tissues of the kidney, as if true gouty action had occurred in the organ itself. Although crystalline deposits are found in other subjects than those who have had gout in their articulations, yet the occurrence is rare, and, besides this, the extent to which it occurs is generally so small as to require a special examination to discover it, whereas, in gouty cases, it is very evident. Of the above three apparently exceptional cases, two were males. 70 and 73 years old; the other a female, 68 years of age, who died from a burn.

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* Fig. 20 represents the crystals of urate of soda in the pyramidal portion of a gouty kidney. Linear magnifying power 220, and polarised light.

† The weight of the healthy kidney has been differently estimated by observers. Some have considered that in the male the average is about 5½ ounces, and in the female 5 ounces. Others think that 4½ ounces is nearer the healthy average. The left kidney is generally somewhat heavier than the right.

Having noticed the constant occurrence of a morbid state of the kidney in advanced gout, and added, if such were necessary, additional proof of the correctness of the observations of Dr. Todd and others, it became a matter of much interest to me to proceed further with the inquiry, and ascertain whether in its slighter forms the kidneys were also implicated, as I had long been impressed with the conviction that an altered renal secretion was closely related to gout.

In the autopsy of Case 6 in the present chapter, it will be observed that there existed, in a well marked form, the shrivelled condition of the kidneys, and a deposit of crystallised urate of soda in the direction of the tubules; points of the same were also seen at the apices of the cones. The microscopic structure was likewise altered, as will be shortly described. In this subject the only external evidence of gout was the presence of two or three small points upon the cartilage of one ear.

In Case 7 the kidneys were also considerably diseased, of small weight, much shrivelled in the cortical portion, and exhibiting the white points at the apices of the pyramids, and streaks of the same salt in the direction of the tubuli. Microscopically the structure was seen to be much altered.

In Case 8 the kidneys, although congested and weighing nearly six ounces each, were granular in structure, and exhibited the same streaks and points as in Case 7.

The kidneys in Case 9 had undergone considerable change, did not exceed three ounces in weight, and contained much urate of soda at the ends of the pyramids, and in the direction of the tubes.

In Case 10 the renal organs were not examined; the allowed inspection being confined to one great toe.

In Case 11 the alteration in the kidneys was a subject of much interest, as only eight attacks of gout had occurred, and no visible sequelæ had remained. Here it will be observed the kidneys were apparently healthy, each weighed four ounces and a half, and the capsules peeled off without difficulty; but when closely inspected, white points were found upon the free ends of the pyramids, and streaks existed, as in the former cases. The microscope also revealed the commencement of other mischief; a portion sent to my friend and colleague, Dr. G. Johnson, who was unacquainted with the case, elicited the following remarks:—"The epithelium in some of the tubes is very granular, and there are a few denuded tubes; the chief change in the kidney is an excess of oil in the epithelium; the outline of the tubes is very dark, depending on an accumulation of small oil globules in the epithelial lining." The deposited urate of soda was very highly characteristic.

In Cases 12 and 13 white streaks and points were observed as in the above cases.

The only gouty subjects examined in which the kidneys were not characteristically affected, were Cases 14, 15, and 16; in all three, however, these organs were much congested, which would render it difficult to detect minute points or streaks, even if present.

At the time when I first observed the white points and streaks upon the pyramidal portion of the kidney, I was inclined to consider the appearance due to the filling of the tubuli uriniferi, and this was evidently Mr. Ceeley's idea; subsequent examinations, however, have led me to form a different opinion; the crystals of urate of soda, which are commonly much larger than in cartilage or ligament, seem to be imbedded in the fibrous structure itself, rather than within the cavities of the tubules.

There is usually besides this, matter partly amorphous and partly crystalline (in needles or rhombs), in the tubes themselves. The needles consist of urate of soda, the rhombs of free uric acid. Drs. Charcot and Carnil found that if a thin section of a gouty kidney is examined by the microscope, the deposited salt is seen to consist of bundles of long prismatic needles arranged in the form of a fan, that the masses are arranged longitudinally in the direction of the straight tubes of the pyramids, and that the deposit is situated in the intervals between the tubes. The addition of acetic acid causes the crystals to change shape and to assume the form of rhombs of free uric acid. They also found the tubes themselves obstructed by cylindrical masses of an apparently amorphous urate of soda.

The microscopic appearances of the kidney in this form of disease have been carefully examined by Dr. George Johnson, and fully described in his work. To his kindness I am indebted for the loan of the slides from which the drawings exhibiting the morbid appearances of the kidney were made. The change in the early state of the disease, when the kidneys are still of their natural size and weight and present to the eye nothing abnormal, appears to consist in an altered condition of the epithelial cells of the convoluted tubes, which become opaque and have an unusually fine granular appearance. Dr. Johnson states, that "in some tubes there is an appearance of entire cells having been shed, so as to fill the tubes and render them opaque; while in others there is an equal filling and opacity of the tubes, from containing epithelium in a disintegrated condition, and which has become so either from the crumbling of the cells while they are still attached to the basement membrane, or from the disintegration of the epithelial cells which have accumulated in the tubes after being shed in an entire form by a process of desquamation." There is often besides this an excess of oil in the epithelium.

After a time the matter contained in the tubes becomes disintegrated, and gradually removed by the watery secretion from the Malpighian tufts, and when this is effected the basement membrane is seen to be left almost denuded, and from being partly concealed by the surrounding fibrous rings, gives to the section a somewhat vesicular appearance. The conditions just described are shown in Fig. 21, where the tubes which are filled with the disintegrated epithelial cells are seen to the right and below; whereas the denuded tubes giving rise to the cystic appearance occupy the rest of the drawing. After a time, and as a result of the removal of the epithelium, the tubes gradually become wasted and shrivelled from the collapse of the surrounding tissue; by this change the Malpighian bodies approach each other, and hence appear more numerous than usual in the field of the microscope. This change I have observed in all the cases of advanced gout in which I have

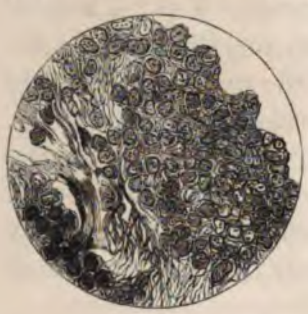
Fig. 21.*

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* Fig. 21 represents the condition of the kidney in gout and some forms of albuminuria (chronic desquamative nephritis). To the right and below the tubes are filled with disintegrated epithelial cells; the cystic appearance in the other parts is produced by the denuding of the tubes and removal of the epithelium. Linear magnifying power, 100.

had an opportunity of examining the kidneys, and it is represented in Fig. 22, where the atrophied and shrivelled tubes may be observed to the right, and the Malpighian corpuscles to the left of the drawing.

During the time the above changes are taking place in the urinary tubes, the blood-vessels of the kidney are undergoing a marked alteration, and this is more especially seen in the Malpighian arteries and capillaries, the coats of which are much thickened or hypertrophied. Dr. Johnson says, that both the circular and longitudinal fibres become affected, but that the longitudinal are increased more than the other set, and hence, when diseased, become of about equal thickness. The smallest arteries, or the afferent vessels of the Malpighian tufts, are those most implicated, and under the microscope exhibit the appearance in Fig. 23, where tortuosity is often combined with hypertrophy. Such a condition of the arteries is only seen when the substance of the organ is

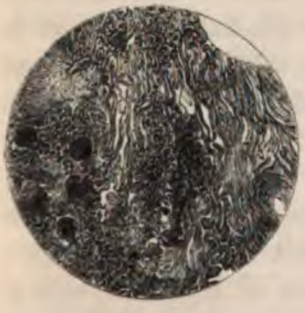

Fig. 22.*

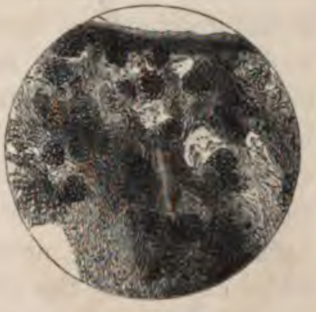

Fig. 23.†

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* Fig. 22, from a section of a kidney in advanced gout, exhibiting, to the right, the tubes in an atrophied and shrivelled state, and to the left the clustering together of Malpighian bodies. Linear magnifying power, 100.

† Fig. 23 represents the hypertrophy of the Malpighian arteries; the muscular fibres are seen to be much enlarged, more especially the circular, in the drawing. Some alteration of focus is required to bring the longitudinal set into view. Linear magnifying power, 100.

much altered, and the impediment to the circulation greatly increased.

Little has been made out with regard to the state of the capillaries of the kidney, but they probably become wasted. The walls of the efferent vessels or veins are certainly not hypertrophied, but, like the capillaries, undergo a slow process of atrophy and contraction.

Deposition of gouty matter in other Organs.—Gouty concretions or deposits have been said to occur not only in the structures we have already alluded to, but also in various other tissues and organs. Thus Rœring found concretions in the lungs of an old gouty man, but there is no evidence to show that they were gouty in character, as they consisted of phosphate of lime, masses of which we know to be far from uncommon in such situations in patients who have never had gout. Landerer found a white deposit on the inner surface of the aorta, said to consist chiefly of phosphate and carbonate of lime with about 14 per cent. of uric acid. Lobstein cites a case in which the deposit on the mitral valve had a similar composition. Dr. H. Bence Jones found a deposit of crystallized urate of soda in the walls of the bronchial tubes; and he and Bramson are said to have found uric acid in the concretions from the thoracic aorta.

I have carefully examined the deposits found on the valves of the heart and the atheroma from the aorta of several gouty patients, who had extensive chalk-stones in different parts of the body, but have failed to discover the least trace of uric acid; tabular crystals of cholesterine are often seen in such matter.[*]

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[*] In the 24th Volume of the Transactions of the Pathological Society of London, there is a paper by Mr. Sidney Coupland on gouty concretion on the aortic valves; in the report on the specimen, however, it is stated that there is

Deposits are stated to have been found in the meninges of the brain of gouty subjects, and Schonlein is said to have detected urates in them; there is no doubt but that they generally consist of phosphate and carbonate of lime, and probably have often no relation whatever to the disease under consideration. It may be remembered that Mr. H. Watson, in his description of the appearances presented by his gouty patient, mentions that on the outer surface of the pia mater there was a cream or smooth chalk-like mucus; but at the time he published his examination, nothing was known of the chemical nature of gouty deposits; their physical characters only were regarded. In many observations, the error has frequently been committed of looking upon all the morbid alterations found in gouty subjects as necessarily connected with gout, whereas they may not be in the most remote degree allied to this disease.

In one case of very severe gout (Case 3, Chapter VI.), I observed some points of deposit on the arytenoid cartilages, and these were proved to consist of urate of soda, both from their microscopic and chemical characters. This may be of some interest in connection with the case of peculiar throat affection accompanying severe gout, described under the head of irregular forms of the disease.

Morbid anatomy of the lower animals in relation to uric acid.—Within the last few years there have been several observations which are of considerable interest in connection with the subject of gout. Dr. Zalesky has found that when he tied both the ureters of pigeons,

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"an indication of the presence of uric acid obtainable by the murexide test, but that the bulk of the concretion is composed, as usual, of phosphate and carbonate of lime." In the above case it was to be expected that all the fluids of the body would be strongly impregnated with uric acid; hence, perhaps, the indication.

geese, and serpents (animals whose urine consists almost entirely of urate of ammonia), they usually lived from twelve to fifteen days; and after death he observed the following changes:—

In the kidneys the tubes in the pyramidal portion were blocked and obliterated with masses of hardened urates, as likewise the ureters above the ligatures; the tubes in the cortical portion and the Malpighian bodies being free from all deposits. The serous membranes, as the peritoneum and pericardium, were sprinkled with white patches, composed of little centres of apparently amorphous urates with needle-like crystals radiating from them.

Masses of the same kind were found choking up the lymphatics, but not in the blood-vessels, which remained quite permeable; the capsule of the liver was freely covered with deposits, but in the substance of the organ they were absent. The smaller bronchial tubes were implicated, as also the endocardium, especially in the neighbourhood of the valves. Some deposits were also found in the muscular walls of the heart.

In birds the mucous membrane of the stomach and intestines was infiltrated; in the serpent the deposit existed in the form of a creamy matter.

In the cartilages and cavities of the joints, and also in the fibrous capsules, urate deposits were found, but none were discovered in the voluntary muscles. In the brain and its membranes nothing was detected by the eye.

As might have been predicted from the above, the blood, bile and other fluids were rich in urate of soda.

Zalesky afterwards nephrotomized serpents and found that they lived about as long a time as when the ureters were tied; but under these circumstances no urate deposits were found in any of the tissues; whence he concluded that the kidneys were the producers and not merely the

Pl. III

Fig. 1.

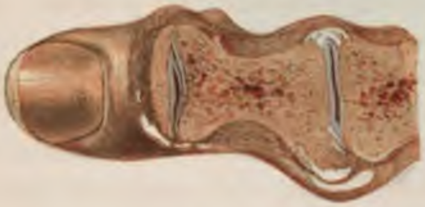


Fig. 2.

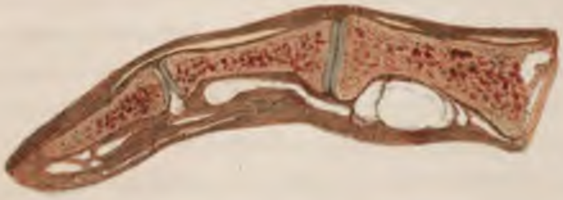
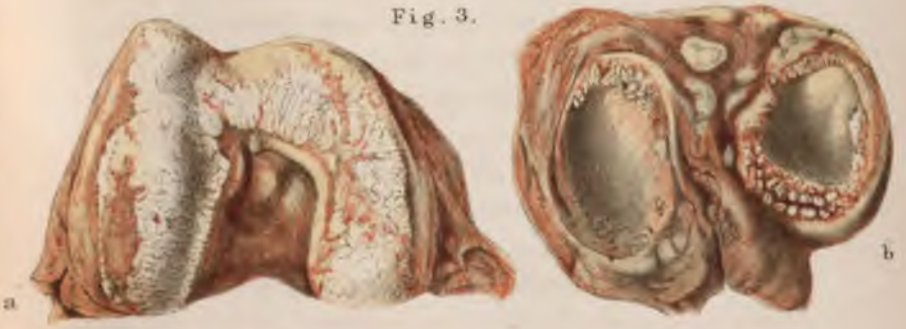


Fig. 3.



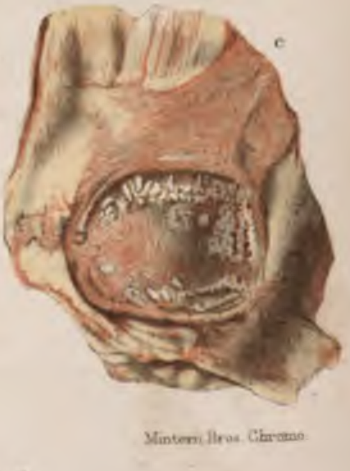
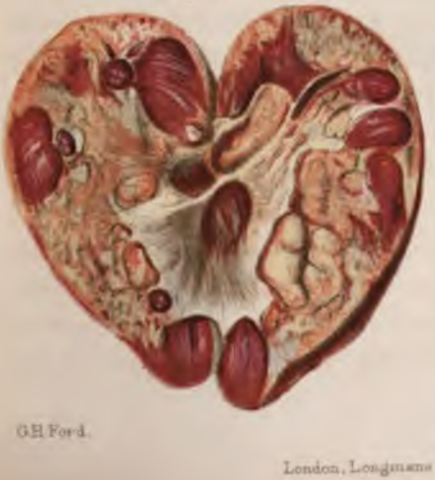


Fig. 4.



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eliminators of uric acid. On birds nephrotomy could not be performed without an immediately fatal result.

In concluding this part of our subject, we will give the results of some observations on the morbid anatomy of certain animals which have been made at different times.

Are urate deposits found as the result of disease in the lower animals?

M. Gleisburgh answers the question in the negative, and considers that most of the alterations of the joints in mammalia and birds which have been attributed to gout, belong rather to a form of chronic rheumatism.

It is, however, a fact that certain birds and reptiles when in captivity have sometimes concretions around their joints, which closely resemble gouty deposits in man. Aldrovandi has noticed them in the falcon; M. Berlin, of Utrecht, has several times observed in the parrakeet the presence of masses upon the metatarsal joints and toes, composed of a white plastery substance, exhibiting both microscopically and chemically the characters of urate of soda. Masses of a similar kind have been seen upon the pericardium, peritoneum and the pyramidal substance of the kidneys of the tortoise and alligator.

My own very limited examination of tumours upon the legs of birds has given me as yet only negative results, but Zalesky's observations would render it probable that uric concretions might be found in the lower animals as a result of disease.

CHAPTER VIII.

CAUSES OF GOUT:—PREDISPOSING CAUSES: HEREDITARY INFLUENCE—SEX—AGE—TEMPERAMENT OR CONSTITUTIONAL PECULIARITY—ALCOHOLIC LIQUORS—DIFFERENCES IN THEIR POWER OF INDUCING GOUT—INDIGESTION—ANIMAL DIET—ABSENCE OF EXERCISE—SEVERE STUDY—MENTAL ANXIETY—RACE—CLIMATE—SEASON—LEAD AS A PREDISPOSING CAUSE OF GOUT—GREAT FREQUENCY OF THE DISEASE AMONG PAINTERS AND PLUMBERS—INFLUENCE OF THE ABSORPTION OF LEAD UPON THE EXCRETION OF URIC ACID—EXCITING CAUSES: WINES, &C.—DYSPEPSIA—COLD AND MOISTURE—MENTAL AND BODILY EXCITEMENT OR FATIGUE.

THE most casual observer must at once perceive that there is a great difference among individuals as regards their liability to gout: some are born with a well-marked predisposition to the disease; others, by the nature of their occupations or habits, acquire it; at some ages it is frequent, at others it is rarely met with; some causes act slowly, requiring months or even years to develop the affection; other influences, although powerless in inducing the disease, may in some individuals rapidly bring on an attack. The causes of gout may therefore be conveniently divided into two classes, predisposing and exciting.

I.—PREDISPOSING CAUSES OF GOUT.

Of these, some manifestly depend on constitutional peculiarity and are inherent in the individual, while others are from without, being produced by external influences.

Influence of hereditary predisposition on the occurrence of Gout.—Most writers acknowledge this influence to be very potent, some have even gone the length of considering gout purely hereditary; such was the opinion of Dr. Cullen; but that it often is acquired, we can bring forward abundant evidence to prove.

Scudamore found that in 523 gouty patients, as many as 309 could trace a predisposition to the disease either from their parents or grand-parents. And from the results arrived at by a Commission of the French Academy, the strong influence of hereditary predisposition is shown, though in a less marked degree than in Scudamore's cases. Of eighty patients suffering from acute or chronic gout, thirty-four attributed the disease to its influence, and in forty-six, the malady seemed to have been acquired. Among my gouty hospital patients, 50 per cent. could establish an hereditary predisposition to the disease; but when the cases which have occurred in private practice are included, a still higher per-centage is obtained. From a somewhat rough estimate made from some thousands of the latter I am of opinion that nearly 75 per cent. inherited the disease from their parents or grand-parents.

On the other hand, experience has convinced me that in this country gout is frequently acquired even at a moderately early age, for in many most inveterate cases not the least hereditary influence could be discovered. Heberden relates an instance of a female who suffered from gout to such a degree as to have numerous sores from chalk-stones, and yet the disease had never been heard of among her relations, and several cases of a similar kind have come under my own observation. One patient, a female, only thirty-nine years of age, who suffered most severely from chalk-stones, could trace no predisposition in any member of her family; and another female, even more crippled, could only ascribe the disease to the large quantities of port wine she had been in the habit of drinking. On the other hand there is ample proof of the fact that the children of gouty parents are, *cæteris paribus*, more liable to gout than those who have no such descent.

A few years since, I was consulted by a gentleman labouring under a severe form of gout with chalk-stones, and, although not more than fifty years old, he had suffered from the disease for a long period. On inquiry I ascertained that for upwards of four centuries the eldest son of the family had invariably been afflicted with gout when he came into possession of the family estate.

It would be needless to dilate further on this subject, as all who have had an opportunity of becoming conversant with the history of this malady must be fully convinced that hereditary predisposition plays no unimportant part in its development.

It is a common opinion, and one with which from my own experience I should be inclined to agree, that gout appears earlier in life when hereditary predisposition exists, than when it is acquired. Scudamore held the same view, but found, on putting the question to the test by the examination of 214 persons who had gout in a very severe degree, that although the influence of hereditary predisposition was well marked in causing the appearance of the disease at an earlier period of life, still it was by no means so strongly shown as he had previously supposed. In a table drawn up by Patissier in his report on the use of the mineral waters of Vichy in the treatment of gout, the mean age of thirty-four cases of hereditary gout was thirty-four years, the extremes being thirteen and sixty years; whereas in forty-three cases of acquired gout, the mean age was thirty-eight years, the extremes being twenty-seven and fifty years.

Although I have seen many patients suffering from gout in somewhat early life who could not trace it in any branch of their families, these cases have been all satisfactorily explained by their habits of life, and I do not remember a single instance of its occurrence in youth where no hereditary tendency existed.

In concluding the discussion of this point, it may be well to relate the particulars of a case illustrating the fearful influence of hereditary taint which has recently come under my notice; the history is very remarkable. The patient is a gentleman, 48 years of age, whose health has been good with the exception of attacks of gout which commenced at the age of 36, in one great toe; for the first few years he had about three or four fits each year, confined to the feet, but the knees and upper extremities were soon implicated, and the attacks became more frequent and more prolonged, and now he is scarcely ever free from them. About 10 urate deposits are seen on the left external ear, and 8 on the right, a moderate amount of chalk-stones about the hands and a considerable quantity around the heels; these latter have often discharged. The urine is pale, has a specific gravity of 1016, but there is no albumen. No fresh gouty symptoms were present at the time of his visit. As far as hereditary influence is concerned it may be thus summed up: the father had very severe gout, the mother, when 70 years of age, began to suffer from it; he has had six brothers, of whom one died of very severe gout, and was crippled from chalk deposits in both upper and lower extremities; another had severe gout and chalk-stones and died of albuminuria; these two had been under my care; a third had gout and paralysis, of which he died; a fourth had gout, and died of erysipelas; a fifth died of gout complicated with some urinary affection;

and a sixth is alive, but suffers from gout in the same way as the patient himself.

Influence of sex upon the occurrence of Gout.—That women are less subject to gout than men is beyond doubt; at the same time the aphorism of Hippocrates, "Mulier podagrâ non laborat nisi ipsi menstrua defecerint," although possibly correct at the time it was written, certainly does not hold good now; but even at the present time, gout in its regular and developed form is comparatively rare among females. The reason of the immunity enjoyed by the female sex will not be difficult to understand, when we have fully discussed the many predisposing and exciting causes which tend to its development; for we shall find that women, from the different character of their habits, are much less exposed to these influences; besides which, a most powerful counteracting influence exists in the presence of the catamenia during a considerable portion of their lives; exceptions however are sometimes met with, and I have seen patients in whom, at the time of pregnancy, the great toe and other joints have been severely attacked.

In the degenerate times of the Roman Empire, when ladies gave themselves up to every kind of licentiousness, they appear, from Seneca's account, to have become the subjects of acquired gout equally with men; but in this country gout in the female is most commonly inherited.

In women, gout is more prone to assume an asthenic form, and to exhibit its masked and irregular manifestations; it is also most liable to appear shortly after the cessation of the menstrual discharge.

In the French table before referred to, in 80 cases of gout, 78 of the patients were men, and only 2 women, and my own experience quite accords with these results. The influence of sex on the occurrence of gout is so great that it becomes a diagnostic mark between gout and rheumatism, for the latter disease is perhaps more frequent among women than men.

Influence of age upon the occurrence of Gout.— Youth, for the most part, enjoys immunity from gout. Hippocrates expressed his opinion on this subject in the following aphorism:—"Puer podagrâ non laborat, ante veneris usum;" and Sydenham states that he had never seen either gouty minors or children; the most that he had observed was the slight foreshadowing of a future attack in the younger branches of gouty families. Heberden, again, never knew a certain case of gout before the age of puberty. On the other hand, instances are related in which gout is said to have occurred in very young children, but I am of opinion that in many of these cases considerable doubt may be entertained as to the correctness of the diagnosis, for in young subjects other joint affections, such as rheumatism and more especially rheumatoid arthritis, may readily be mistaken for gout.

The period of the first attack was noted by Sir C. Scudamore in 515 cases, and the results of his inquiry are seen below:—

At the age of eight	1
„ twelve	1
„ fifteen	1
„ sixteen	1
„ seventeen	1
„ eighteen	5
„ nineteen	3
Between twenty and twenty-five years of age	57
„ twenty-five and thirty „	85
„ thirty and thirty-five „	105
„ thirty-five and forty „	89
„ forty and forty-five „	64
„ forty-five and fifty „	54

Between fifty and fifty-five years of age	26
„ fifty-five and sixty „	12
„ sixty and sixty-five „	8
At the age of sixty-six	2
	515

Scudamore, in alluding to the above table, remarked that he had not himself witnessed many examples of a first attack of gout before twenty, nor any after sixty-six.

It will be observed from the above, that in by far the majority of cases, gout makes its appearance in adult age, after the growth of the body is complete, and before the powers begin to decline; when the age is measured by decennial periods, the greater number of cases are found to occur between the thirtieth and fortieth year.

Between genuine gout and rheumatism, or rheumatic fever, a marked distinction is seen in the age at which they appear; for while a first fit of the former seldom occurs before thirty-five, the earliest attacks of the latter are rarely delayed till that age.

Some years since I was called upon to treat a first and only attack of the disease, in a gentleman at the age of seventy. The patient was suffering from valvular disease of the heart, with dyspnœa and anasarca of much severity. Early one morning, and at a time when there was scarcely any anasarca, the ball of the left great toe became hot, swollen, and painful; after a few days the fit passed off in the usual manner, and was succeeded by desquamation of the cuticle. During the time the gouty symptoms were present, marked relief in the breathing was experienced.

I have known several cases in which the first attack occurred after seventy years of age. In 1866 I attended a lady, then in her ninety-first year, who was labouring under a first attack of gout in the great toe: this lady had up to the age of eighty-seven been active in her habits, but for a year or two before the seizure had been kept almost entirely to her bed. I have recently seen several cases in which the patients were nearly eighty years of age; one, a gentleman with strong inherited tendency to gout, but in whom it had probably been delayed by residence at Gibraltar for forty years.

A late Bishop of Durham experienced a first attack of gout at the age of ninety, but although congratulated by his friends and assured that it would be the means of prolonging his life many years, he only lived to ninety-two; when about twelve years old this gentleman had the operation for lithotomy performed upon him.

On the other hand I have seen gout in comparatively young subjects; for instance, I was consulted some years since by a young gentleman, only seventeen years of age, just recovering from a second attack of gout in the left great toe; his first fit had occurred about twelve months previously in the same joint. In this instance the influence of hereditary predisposition was very strong, both father and mother and many other members of his family on each side having suffered from the malady.

Several patients have informed me that they had experienced distinct attacks of gout at very early ages, when they were pupils at the public schools; one gentleman, now a severe sufferer from gout, assures me his first attack occurred at nine, his second at twelve years of age.

A little girl not quite ten years of age once came under my care, whose case is somewhat remarkable.

When only seven years of age, the right great toe ball became suddenly swollen, red, and painful; it was supposed that this must have arisen from some sprain; her general health was not good at the time; two years afterwards, she had a very slight return in the same joint. About nine months after this a third attack came on, much more severe, and extending over the arch of the foot. There was also a slight eruption of psoriasis on the legs. At the time when I first saw this patient a fourth attack had commenced, and the great toe was hot and shining, the rest of the foot being cool; desquamation of cuticle occurred subsequently. The urine at 8. A.M. had a specific gravity of 1020 and was free from albumen; it frequently became thick on standing, especially about the time of an attack. The child was rather anæmic.

During the next twelve months she had three or four attacks, implicating for the first time one knee, then one hand. No beer or wine had been taken, in fact no alcohol in any shape. On enquiry it was found that there was only slight hereditary predisposition to gout: on the father's side one great uncle, on the maternal side a great grandfather and several great uncles had suffered from the disease, but not her grandfather; her mother had occasionally slight threatenings in the toe.

Another less marked case came under my care in 1866, in a child under eight years of age, who within the previous year had two attacks in one ankle; the first induced by a slight injury, the second occurring without any known cause. This child inherited gout from her father, who had it severely, and from her mother's family.

Influence of temperament or constitutional peculiarity on the development of Gout.—It must be remembered that the ancients, from the time of Hippocrates, held the opinion that there existed four kinds of humours in the human body,—blood, bile, black-bile, and phlegm, and that, as one or other of such humours was present in excess, the individual was said to be of a sanguineous, bilious, melancholic, or phlegmatic temperament. These terms, though still employed in medicine, are used with little precision, and much reliance cannot be placed upon the indications they are supposed to give. The term "nervous temperament" is also occasionally employed, to characterise a peculiar irritable state of the nervous system.

With regard to the influence of the so-called temperament upon the occurrence of gout, I have little information to offer, having derived nothing satisfactory from my own observation, and having met with the disease in individuals presenting every variety of bodily conformation. In general terms it may be said that acute sthenic gout occurs most frequently in subjects of a sanguine temperament, and those inclined to corpulency; whereas the asthenic and irregular forms are usually seen in individuals of a nervous temperament and spare habit of body.

Dr. Cullen made the following observations on the influence of temperament:—"If, with the ancients, we might define by certain terms the temperaments of men, I could say that the gout attacks especially men of a choleric-sanguine temperament, and that it seldom attacks the pure sanguine or melancholic. It is, however, very difficult to treat this matter with due precision." And in another place he says, "It attacks especially men of robust and large bodies, men of large heads, and of full and corpulent habits, and men whose skins are covered with a thick rete mucosum, which gives a coarser surface."

Influence of fermented and distilled liquors in inducing Gout.—There is no truth in medicine better established than the fact that the use of fermented liquors is the most powerful of all the predisposing causes of gout; nay, so powerful, that it may be a question whether gout would ever have been known to mankind had such beverages not been indulged in.

A considerable difference, however, exists between the various fermented liquors in their power of inducing gout, and many interesting observations and facts can be elicited in relation to this point.

On the first consideration of the question, it would be natural to suppose that, as the chief peculiarity of all fermented liquors consists in the alcohol they contain, their power of causing gout would be in proportion to the quantity of spirit in their composition, but a more careful investigation of the subject fails to establish this supposition. Distilled spirits, when exclusively taken, appear to exert little or no power in inducing gout, whereas wines, strong ales, and porter, are potent agents, a fact which is forcibly impressed on the mind on taking a review of the prevalence of the disease in different countries and among different classes of individuals. In Scotland gout is much less frequently met with than in England, and I have been assured by physicians in that country that they very seldom see a case, and when it does occur it is generally in the upper classes of society and in large cities, where wines and ales have been largely substituted for whisky. Dr. Gregory, at the Royal Infirmary of Edinburgh, had only two cases of gout in two thousand two hundred clinical patients admitted under his care, and Dr. Hamilton, during nearly thirty years, had likewise but two such patients. Sir Robert Christison bears similar testimony, for he informed me that he had only met with two cases of gout in the Infirmary, although physician to it for thirty years, and both the subjects were fat and overfed English butlers. The same freedom from gout is enjoyed in other Scotch cities, as Glasgow and Aberdeen, as likewise in Ireland, where whisky is the principal beverage; and Russians, Poles, Swedes, and Danes, who usually drink distilled spirits, also enjoy comparative immunity from gout.

Van Swieten states that in Holland gout was but little known until wine was introduced as a substitute for small beer; and Linnæus, from his observation upon the habits of the Laplanders, was inclined to regard wine as almost the sole producer of gout, as the people partook of malt liquors with impunity.

These statements of Van Swieten and Linnæus merely render it probable that wine is more powerful in producing gout than the beer drank in those countries; we shall soon, however, have occasion to show that malt liquors, more especially the stronger varieties, are most potent predisposing agents.

There are many instances on record which illustrate the relative powers possessed by spirits, wines, and malt liquors, in this respect. Scudamore gives an account of two; the first was a strong and corpulent man, about 30 years of age; in the earlier part of his life he had been constantly on the sea coast as a smuggler, and had drunk two or three pints of Hollands a day; this habit was continued during a period of four or five years, without further result than to make him somewhat nervous and dyspeptic. He afterwards became a bricklayer, and being possessed of property, indulged both in wine and porter, and in two years afterwards was attacked with gout.

In the second instance the patient lived in the country until he was 28 years of age, and partook freely of Hollands. He then engaged himself as a butler in

London, indulged freely in wine and malt liquors, and at the age of 35 had gout, which returned in each year.

In neither of the above mentioned cases did the slightest hereditary predisposition exist; but in relation to them it may fairly be urged that along with the change from spirits to malt liquors and wine, there was considerable alteration in the occupations of these patients, and that they were approaching the age at which gout commonly manifests itself.

A striking example, illustrating the same fact, is recorded by Dr. William Budd, who states that, "There is a body of men employed in the Thames, whose occupation it is to raise ballast from the bottom of the river; as this can only be done when the tide is ebbing, their hours of labour are regulated by this circumstance, and vary through every period of night and day. They work under much exposure to inclemencies of weather; their occupation requires great bodily exertion, occasioning profuse sweating and exhaustion. In consideration of this, their allowance of liquor is very large; each man drinks from two to three gallons of porter daily, and generally a considerable quantity of spirits besides. This immoderate consumption of liquors forms the only exception, as far as relates to food, which these men offer to the general habits of the lower classes, and, although not a numerous body, many of them are yearly admitted to the Seamen's Hospital Ship affected with that disease (gout)." This very interesting fact seems to show that no amount of bodily exertion is adequate to counteract the influences of such large quantities of porter. These men are almost all derived from the peasantry of Ireland, and can rarely or never inherit a disposition to gout.

My own experience of the relative power of alcoholic liquors in inducing gout, may be thus stated: port, sherry, and other stronger varieties of wines ordinarily drunk in this country, are most potent in their operation; but the fact must not be lost sight of, that those who are in the habit of drinking wine, are, at the same time, able to procure other luxuries of the table, which greatly favour the development of the disease. A few years' liberal indulgence in port or sherry wine will often of itself produce gout, when no hereditary tendency exists; and even among the labouring classes this may be occasionally observed, when, from the peculiar nature of their occupations—as in the case of cellarmen, and wine-bottlers, &c.—men have an opportunity of taking wine in considerable quantities.

The lighter wines, as claret, hock, and moselle, although capable of acting as the exciting cause of an attack in gouty subjects, have, when taken in moderation, but comparatively little inducing power, and in this respect rank with the weaker kinds of malt liquors. The wine-drinking population of France and Rhenish Germany are but little afflicted with gout, and the same remark holds good of our own agriculturists; but when the finer qualities of these wines are freely partaken of, especially if combined with excess of animal food, gout is by no means tardy in manifesting itself. In some of the larger cities of France and Germany gout is common, although considerably less so than in England, and in Bavaria and Berlin, where a large amount of beer is drunk, gout also prevails.

Champagne differs much in its effects; probably, if very dry, it would not act so powerfully as a predisposing cause as port or sherry, but it is certain it is often a most active exciting cause of an attack.

Dr. Wood, of Philadelphia, whose opinion I asked on this subject in 1862, says that the stronger wines, as sherry, madeira, and port, have appeared to him to be the most prolific source of gout in the States, and that since the lighter wines had been in more general use, he thought there had been a decided diminution of gout; he was quite certain that the excessive use of malt liquors led to the disease.

Stout and porter rank next to wine in their power of inducing gout, and some of the most severe and inveterate cases I have ever met with in hospital practice have been in patients who had drunk heavily of these beverages; as happens, for example, among the men connected with the great London breweries, who not unfrequently drink an almost fabulous quantity of porter. I have notes of the case of a man, 28 years of age, suffering from severe gout and a deep-seated abscess in one foot, who assured me that when at work he seldom took less than three gallons of porter during the day.

Strong ales, and even the ordinary bitter beers, so commonly used at the present day, exert a similar influence, although there are many who think they can drink bitter ale with impunity; this is exemplified in the following case. A man only 30 years of age, connected with a pale ale brewery, consulted me under the following circumstances; he had had his first attack of gout four years previously, at the age of 26; it was slight, and confined to the ball of the right great toe; three years afterwards he suffered from a severe fit, implicating not only the toe but the ankle, heel, and knee; during the year previous to my seeing him the attacks had been more frequent, at intervals of about three months, and were assuming a chronic form. No hereditary tendency could be discovered in any branch of his family, although carefully sought for, and the disease appeared to have been induced simply by the habit of repeatedly drinking during the day small quantities of pale ale. Several other very similar cases have come under notice within the last few years.

Cider and perry act to some extent as predisposing causes of gout, although probably a much larger quantity is required than of the stronger kinds of malt liquors. In Devonshire and Herefordshire, gout, as far as my own experience enables me to judge, is by no means infrequent. Dr. Wood remarks that, as a *predisposing* cause, cider cannot be very potent, otherwise gout would be more prevalent among the people of New England and the middle Atlantic States, where this beverage is very commonly employed.

Mr. Haviland, formerly of Bridgewater, has kindly afforded me some valuable information upon this point, the substance of which is as follows: he acknowledges that there are doubtless many cases of gout in the cider districts, although he has been unable, during a long experience, to establish the fact of a single case having been really due to the drinking of cider; he states that, on looking over the books of the Bridgewater Dispensary, he did not find an entry of a single gouty patient during a period of 30 years, and that a personal experience of four years at the same institution has given the same negative result; and again, during 15 years at another dispensary, where the average number of patients is about 250—nearly all agricultural labourers, with their wives and children—there were only three cases of pure gout, and these occurred in beer drinkers. Gravel and calculus are also rarely met with in the cider districts.

These remarks apply only to rough cider, which has a low specific gravity and is devoid of sugar.

From a review of all the facts known in regard to cider, I think we may fairly draw the following conclusions:—

1st. A fully fermented cider, one therefore free from sugar, and termed rough cider, has but little power of inducing the gouty diathesis.

2nd. Partially fermented or sweet cider predisposes to gout.

3rd. Either variety, when taken by persons predisposed to gout, and not much accustomed to its use, may excite an attack of gout.

Having fully established the fact that some alcoholic drinks possess much more power than others in causing gout, it next becomes interesting to inquire the reason of such differences.

Why are distilled spirits less prone to induce gout than those which have simply undergone the process of fermentation?

The influence of fermented liquors is certainly not in the direct ratio of the amount of alcohol contained in them; for the same quantity of spirit which in the form of port wine is capable of developing the disorder, is completely powerless if taken in the form of whisky; and the same holds good when the comparison is made between strong malt liquors and spirits.

Is there any known difference in their composition to account for this?

Distilled liquors, as brandy, hollands, whisky, gin, and rum, contain alcohol and water, with small amounts of colouring substances and also ethers, to which their peculiar aroma and taste are due; the amount of absolute spirit varying in the different varieties from 40 to 70 per cent.

Wines, on the other hand, beside spirit and water, contain sugar, gum, extractive, albuminous, and colouring matters; free acids, as tartaric, racemic, malic, œnanthic, and acetic acid; also potash, lime, and magnesia combined with these, together with sulphate of magnesia, common salt, and traces of phosphate of lime; besides these, especially in the cellared wines, are certain ethers which impart aroma, especially œnanthic and acetic ether. Tannic acid is also present in the red wines.

As the nature and amount of these different principles are liable to considerable variation, some arrangement in groups may be advantageously adopted.

I have made the following classification, which is sufficient for all medical purposes:—

1. Spirituous wines, containing a considerable quantity of saccharine or unfermented matter, and an amount of alcohol, usually above 15 per cent. by weight. The chief wines in this class are Port, Sherry, Madeira, Marsala, &c.
2. Liqueur wines, containing much sugar: Tokay, Malaga, Tent, Constantia, &c., the higher Sauternes; per centage of alcohol between that of the 1st and 3rd classes.
3. Acidulous wines, rich in acid tartrate of potash; alcohol not much above 10 per cent.
    (*a*) With tannin and colouring matters: Clarets or red Bordeaux wines; red Burgundies and Hungarian wines.
    (*b*) Without tannin or colouring matters: Hocks, Moselle, Chablis, and the light dry Sauternes.
4. Effervescing wines, containing unfermented matter and free carbonic acid: Champagne, Sparkling Hock, and Moselle, and Sparkling Burgundy.

As regards the amount of alcohol (absolute and by weight), these beverages may be arranged in the following order:—

Of Spirits. Rum, strong (75 per cent), ordinary Rum (44), Brandy (44), Whisky (44), Geneva (44), Gin (35).

Of Wines. Port (19), Madeira (18), Sherry (17), Marsala (17), Champagne (11), Burgundy (10), Clarets (8), Hock or Rhine wines (8), Moselle (still) (7·5).

Of other Liquors. Porter (Stout) (6·5), Pale Ales (6), Cider (4·5), Common Ales (3·5).

The above figures are fair approximations only; for wines of the same name differ considerably among themselves in many of their properties; and the same remark applies to the other beverages.

As regards acidity, Dr. Bence Jones has ascertained that wines may be arranged in the following order, beginning with the least acid:—Sherry, Port, Champagne, Claret, Madeira, Burgundy, Rhine wines, and Moselle. The least acid of all alcoholic fluids are Geneva and Whisky, then Rum and Brandy, afterwards Ale, Porter, and Stout. All the wines are found to be more acid than malt liquors.

The following was ascertained to be the order when measured by the amount of saccharine matter, beginning with the least sweet:—Geneva, Rum, Whisky, Claret, Burgundy, Rhine wines, and Moselle, have no sugar; then Brandy, Sherry, Madeira, Champagne, Port wine, Cider, Porter, Stout, Malmsey, Ale, Tokay, Samos, Paxarete and Cyprus.

Does our present knowledge of the relative composition of the different kinds of alcoholic liquors throw any light upon their varying powers of inducing gout? So much, at least, is proved; that it is certainly not simply the amount of *alcohol* in the fluid, which determines the result, for we have shown that whisky and other distilled spirits have little power; at the same time it will be observed that the wines richest in spirit are usually the most potent predisposers to the disease, as illustrated in the case of Port.

The presence of *acidity* in alcoholic fluids cannot be looked upon as having much influence, seeing that Port and Sherry are among the least acid wines, and that strong malt liquors, usually freer from acidity than wines, are powerful predisposing agents; on the other hand, the more acid wines, as Clarets and Hock, are comparatively harmless in this respect; in exciting a paroxysm of gout, it is probable that the amount of acidity is of much moment.

The quantity of *sugar* can hardly be considered to exercise much effect, for it exists in large quantities in some of the most potent gout-inducing liquors, in small amounts in others, and certainly no direct ratio can be established between the presence of saccharine matter and the predisposing power of any alcoholic beverage.

But little is known respecting the *saline matters* of wines and other liquors; it is probable that the alkaline salts, especially those of potash, more abundant in the lighter wines, and which produce diuresis, may in some way lessen their injurious effects.

From our present state of knowledge the following are the only conclusions which can be safely drawn in reference to this subject:—

1. Diluted alcohol, in the form of distilled spirits, has little power to produce gout, at least in those who are not already predisposed to it.

2. Alcohol when in combination with other substances, as in wines and malt liquors, becomes a potent cause of gout; and the greater the amount of contained spirit in

such beverages, the more powerful their influence in producing the disease.

3. Neither the acid, sugar, nor any known principle contained in these liquors, can as yet be proved to impart to the alcohol its predisposing influence; for wines the least acid, and liquors the least sweet, are often among the most baneful.

To which we may add a fourth conclusion, with some probability of truth:

4. Alcoholic fluids which have little tendency to cause dyspepsia, and those which act more especially as diuretics, can, as far as gout is concerned, be taken with greater impunity than beverages of an opposite character.

It must be borne in mind that our remarks with regard to distilled spirits apply simply to their slight influence in the production of gout, and it must not for a moment be supposed that these liquors are less pernicious in other respects than wines; on the contrary, the occurrence of granular kidney and dropsy is exceedingly common among populations who partake of them largely.

Influence of solid food in causing gout.—It is difficult to assign the share that different articles of solid food have in the production of gout, and to separate the effects of indigestion, caused by any article of diet, from the secondary influence of the same after it has become absorbed. As far as composition is concerned, it is probable that articles of food containing saline matters, as the salts of potash and soda, are useful in keeping up the activity of the secreting organs, and that many such substances, even if acid to the stomach, yet act as antacids to the blood and urine from becoming decomposed and converted into carbonates of the bases. Pie-crust and sweet substances are probably injurious rather from the indigestion they may induce, than from containing any very noxious principles.

Made dishes, or those which are rich and complex, are apt to disturb the stomach, and hence, through indigestion, predispose to gout. The amount of hardness of the fibre of meat has a great influence on its digestibility, hence salted meats, veal, and pork, are apt to lie heavy in many stomachs, and thus induce dyspepsia.

Dr. William Budd, in speaking of the influence of the amount of animal food consumed in producing gout, remarks:—"During a long and extensive professional connection with a large rural district, we never knew an instance of gout among agricultural labourers, who of course form the great mass of the population; gout was not uncommon among tradesmen, but still more frequent in the class of gentlemen and opulent farmers. That the quantity of animal food consumed by agricultural labourers is comparatively very small, must be well known to persons who have lived in the country; and we believe that this circumstance has considerable share in procuring for that class their singular exemption from gout. It is nearly established that large consumption of animal food tends to produce the lithic acid diathesis; a condition so often associated with gout, that more than one author has been led to consider these forms of disease as essentially connected. In advancing the opinion that large consumption of animal food is a cause of gout, we are glad to avail ourselves of the support of one of the most distinguished physiologists of our day. Müller, in commenting on Magendie's experiments on food, says, 'These experiments have thrown some light on the causes and mode of treatment of gout and calculous disorders. The subjects of these diseases are generally persons who live well and eat largely of animal food.'"

Indigestion and want of exercise.—It is often a task of much difficulty to separate the effects of indigestion produced by the character of the food itself, both as to quantity and quality, from those caused by other circumstances, such as want of bodily exercise. Cullen remarked that gout seldom attacked persons employed in constant bodily labour, or those who live much upon a vegetable diet; and few would feel disposed to differ from him as to the general truth of the statement, for it is rare to find gout among a rural population, where much toil is endured, and where meat forms a comparatively small proportion of the diet; on the other hand, its occurrence is frequent among those who freely partake of highly seasoned dishes, and who are in the habit of consuming a quantity of nutriment far above the requirements of the system. This may be accounted for by the fact that an excess of food, more especially when highly nitrogenised, favours an increased formation of uric acid, which has already been shown to bear a close relation to the development of gout.

Not only does an undue amount of food predispose to gout, but the manner in which it is assimilated has also an influence; for when digestion is imperfectly performed, the disease is more likely to become developed. Sydenham from his own experience came to the conclusion that gout arises from what he termed a weakened concoction both of the solids and fluids; and although we have brought forward evidence to show that defective excretion plays an important part in its production, we must not lose sight of the very powerful influence of imperfect digestion and assimilation.

It is a matter of interest to inquire what are the varieties of dyspepsia which, by long continuance, give rise to the gouty diathesis and subsequently to the development of the joint affection? The answer is simple. Many forms of atonic indigestion are almost inoperative in this respect, as they merely prevent the proper formation of chyme, and diminish general nutrition of the body; but those varieties of dyspepsia which lead to the excessive formation of uric acid in the system, tend powerfully to the production of gout. Clinical observation has convinced me of the truth of this statement, for I find that in some forms of dyspepsia, the formation of uric acid is even below the healthy standard, but in other forms the amount is greatly augmented; it is in the latter varieties only that we can anticipate the development of the disease, and these are generally accompanied with sluggish circulation in the portal system and congested liver.

In many gouty subjects this congested condition of the portal system is so marked, and the relief afforded by the administration of medicines which act on the liver and bowels so great, that some physicians have come to the conclusion that gout is essentially connected with such disturbance; this, however, is erroneous, for in many of the most severe instances of gout, no such disturbance of the portal system can be discovered, and it is certain that the blood may be brought into a gouty condition from causes in no way connected with the biliary function of the liver.

It must be borne in mind that in gouty cases, especially where many attacks have already occurred, little can be determined with regard to the nature of the dyspepsia which laid the foundation of the disease; for as malassimilation may lead to the production of uric acid, so an excess of uric acid circulating in the blood may itself give rise to a secondary form of dyspepsia, and cause many of the premonitory symptoms referable to the digestive organs, so commonly met with in gouty subjects.

The more prominent symptoms of the dyspepsia connected with the uric acid diathesis may be thus summed up: heartburn and eructations, oppression, and frequently sleepiness after food; a feeling of distension in the epigastrium, at times accompanied with tenderness; some fulness over the hepatic region, the edge of the liver projecting a little below the ribs, and being occasionally tender to the touch; the tongue much furred, red at the tip and edges, a disagreeable and clammy taste in the mouth, and the saliva and buccal secretion often more adhesive than natural. The bowels are usually confined, the actions scybalous, sometimes very dark in appearance, at other times light and clay-coloured, indicating either a retention of bile in the gall bladder or a defective biliary secretion. Accompanying these symptoms there is a scanty secretion of urine, which is high coloured and strongly acid, and gives rise on cooling either to a copious deposit of pink urates, or to a sediment of crystallised uric acid.

Influence of severe study and mental anxiety, &c., &c.—That the condition of the mind has a powerful influence upon the manner in which the functions of the various organs of the body are performed, is at once rendered evident by watching its effect upon the digestive and renal organs. It is not uncommon to find that a severe fit of indigestion immediately follows the receipt of painful intelligence, and most people are cognisant of the intimate relation existing between the state of the mind and the secretion of the kidneys. As powerful influences cause very appreciable changes in certain functions, so slighter ones act as surely, though slowly, in altering the general nutrition, and in the end produce great and lasting mischief. Severe and prolonged study, which is almost necessarily conjoined with a sedentary life, tends greatly to lower the tone of the excretory organs, at the same time that it impairs the powers of digestion; both of which circumstances engender an impure condition of blood. There are many cases on record, among men eminent for their talents and application, which could be brought forward in proof of the influence of mental labour in causing the development of gout, and likewise in exciting its attacks; but it will suffice to quote the words of Sydenham in his letter to Dr. Short, in which he says, "I send you a short tract upon Gout and Dropsy, instead of the thicker volume, which in my own mind I had determined on, viz., a history of such chronic diseases as my practice has most especially met with. By applying my mind, however, to its utmost, and by bringing all my powers of thought on the subject, I brought on a fit of gout, such as I had never before suffered from; so that the fact itself warned me to lay aside, even against my own will, such lucubrations, and to take care of myself; well satisfied with having, in some measure, dealt with these two diseases. Whenever I returned to my studies, gout returned to me."

In another part of the same treatise the author states that more wise men than fools suffer from gout, and from this and like evidence but one opinion can be arrived at as to the influence of severe and protracted mental exertion on the development of the disease; at the same time I believe that the mental influence alone would be inoperative, unless aided by hereditary predisposition. In relation to this subject, Scudamore remarks, that "the late Mr. Pitt and his father suffered from gout at an early period of life. The father was a votary to Bacchus; of the son this could not strictly be said: but both were ardent students." It it also a well-known fact, that, in this country at least, cabinet ministers and politicians most distinguished by their talents and assiduous application, are frequently severe martyrs to the disease.

Other powerfully depressing influences, as sorrow and chagrin, act in engendering a gouty habit; thus, reverses of fortune have been known to do so, although usually accompanied by circumstances which might be supposed to prevent its development; the same has been asserted of other mental emotions.

The influence of venereal excesses in the production of gout was much insisted upon by early authors. Hippocrates's aphorism relating to this point is only partially true; were it literally correct, eunuchs should be altogether free, but Galen assures us that in the time of the Roman empire they enjoyed no exemption. Venereal excess, like all other depressing agencies, lowers the function of the nervous system, and hence favours the production of the malady; but its real influence is the more difficult to separate and define, inasmuch as it is frequently associated with immoderate indulgence in alcoholic liquors; hence the lines of the Greek poet in which Gout is described as the daughter of Bacchus and Venus:

Λυσιμελοῦς Βάκχου, κὰι λυσιμελοῦς ᾿Αφροδίτης
Γένναται θυγάτηρ, λυσιμελῆς Ποδάγρα.

In the treatment of chronic forms of gout it is important that the effects of these various depressing causes should not be lost sight of.

Influence of race, climate, and season.—The influence of *race* can scarcely be said to be known. It is, however, stated by Dr. Quarrier that negroes serving as sailors in the British Navy are apt to become gouty. There is every probability that individuals of all nationalities would be susceptible of gout if brought under the influence of the predisposing causes of that disease.

It is a very difficult task to investigate accurately the real effect of *climate* upon the development of gout, for so many other influences are connected with climate, that the separation of one from another is rendered almost impossible. There are, however, certain facts which appear to be well established in relation to this subject, of much interest, and not devoid of importance.

Gout is undoubtedly much less prevalent in hot, than in temperate climates. Among the natives in the interior of Africa, we are told by Dr. Livingstone, that this disease, as well as calculus, is unknown, and it is a well-known fact that gout is not common in the East Indies, except among European residents who have acquired it elsewhere; the same remark applies to the natives of other tropical climates, for in Turkey, China, Japan, Peru, and the Brazils, the disease is scarcely known, and in Italy it is much less frequent than in France or England.

It would, nevertheless, be dangerous from these facts to draw the inference that this immunity is due to the effect of climate, for the inhabitants of warm countries are often free from many of the other predisposing causes of gout; for example, they seldom partake of alcoholic liquors, and their food is less nitrogenised than that of nations in which gout is prevalent. We have also proof that circumstances other than mere climate influence the development of gout in the fact that in Rome, under the Republican form of government, the disorder was little known, but under the Empire, when luxury and indolence prevailed, it became extremely common, even among women. The immunity enjoyed by the Scotch, Irish, Russians, and Poles depends upon their abstaining from strong wines and malt liquors, rather than upon any peculiarity of their climate.

The influence of *season* in causing a fit is often well shown in the earlier stages of gout, when the intervals between the attacks are considerable. That the disease is most apt to occur in spring and autumn is a fact known from the earliest antiquity; Hippocrates remarks, in one of his aphorisms, "Podagrici affectus vere et autumno plerumque moventur." Galen affirms that spring is the season when the return of gout is to be expected; and Sydenham says that about the end of January, or beginning of February, it usually breaks out.

The examination of a large number of gouty patients with reference to the time of year when the first attack of the disease manifested itself, has fully satisfied me that the opinion of the ancients is correct. I have usually found that not only the first, but several of the early annual attacks, take place in the spring; after a time an autumnal fit is added, but when the disease has become engrafted into the system, the returns are more frequent and at less regular intervals.

As a rule, even those who suffer from the more chronic forms of gout are comparatively free during the hot months of summer, though occasionally well marked exceptions are found, and I have seen some few patients who suffer more in summer than at any other time of the year.

Influence of Lead as a predisposing cause of Gout.— It is a well-established fact that metallic impregnation is capable of inducing pains in the extremities which bear a close resemblance to those of rheumatism; artificers exposed to mercurial vapours often suffer from what is termed "neuralgia mercurialis," and plumbers and painters are afflicted with somewhat similar pains, which have been designated "lead arthralgia, or metallic rheumatism" by Sauvages. The peculiarities of the latter affection consist in the pain being severe, and following to some extent the direction of the large nerves, and not being accompanied with tenderness, redness, or swelling.

At the time of the publication of the first edition of this work, I was not aware that the frequent occurrence of gout among those affected by lead had been noticed; but I find that Musgrave, and Huxham, and Dr. William Falconer (1772), had had their attention called to the fact, and had made known their observations. Dr. C. H. Parry published in 1825 a passage dated 1807, headed "Gout from Lead," and attributed the effect of the metal to its power of producing arterial plethora. Dr. Todd also alludes to the subject in three of his works. Ignorant of the above, in 1854, in a paper read before the Medico-Chirurgical Society,* I alluded to the curious fact that a very large proportion, at least one in four, of the gouty patients who had come under my care in the hospital, had at some period of their lives been affected with lead, and for the most part followed the occupation of plumbers or painters. Since that date I have kept the subject prominently before my mind, and further experience, up till now, has fully confirmed the correctness of my original statement. I have also ascertained, from repeated inquiries of the masters and men, that gout is much more prevalent among painters than other workmen earning similar wages; there appears to be nothing in the habits of these men to account for their peculiar liability to gout, with the exception of their exposure to the influence of the metal.

Some questions of interest in connection with this subject at once suggest themselves to the mind. Can lead impregnation induce gout without the co-operative aid of other predisposing causes? Granting the powerful influence of this cause, in what manner does it act in producing such result?

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* Medico-Chirurgical Transactions, vol. xxxvi., for 1854.

I am not prepared to answer the first question in the affirmative, but at present should hesitate to assert that the metal cannot of itself occasionally lead to the development of gout. It would be interesting to ascertain whether in countries where gout is uncommon among the working classes, as in France and Scotland, painters and plumbers are sufferers from the disease. Tanquerel des Planches, in his "Traité des Maladies de Plomb," although he gives an account of a great number of patients who suffered from lead-poisoning in its different varieties, does not allude to any of them having had gout.* Through the kindness of Sir Robert Christison I am enabled to give the results of his valuable experience. In answer to some inquiries in 1859, he remarked as follows: "I am unable to supply you, from Edinburgh experience, with any information relative to the question, whether gout is apt to occur among those who are liable to suffer from exposure to the deleterious influence of lead. Poisoning from protracted exposure to lead is a very rare occurrence in Edinburgh. When I first became acquainted with the diseases of the working classes here, namely, in 1817, as clinical clerk, a few characteristic cases of lead-colic and palsy were annually admitted into the infirmary from a white lead manufactory carried on according to the old process at Portobello, a village three miles off. In a few years this source of supply ceased, in consequence of the owner of the works adopting the method of separating the white lead from the metallic plates, and subsequently grinding it under water. Not many years after that change, the manufactory was given up. Although I have been physician to the hospital from 1827 until two years ago, I have not seen a single case of lead-colic or ordinary lead-palsy during all the intervening period. I can recollect two cases of wrist-drop in compositors, that is all. Among house-painters and plumbers, both of them numerous here, as they work extensively in the country around as well as in the city, I have never encountered a single instance of lead disease in any of its forms. I remember making inquiries about the effects of lead from an intelligent house-painter, who was my patient in the hospital for some other disease; and it appeared that he had never even heard of workmen in his trade being liable to any disease depending on exposure to lead. It is so far in accordance with your conclusions, that we know as little of gout, as of lead disease, among our hospital patients. Gout occurs very rarely. I have known but two cases of it among my whole hospital service; both were in fat, evidently over-fed butlers. I was anxious to ascertain the cause of exemption of our painters and plumbers from lead disease, especially painters, who suffer from it so much elsewhere—even in London, for example. A journeyman, who had been a house-painter for seventeen years, a part of which he had spent in London, was well acquainted with lead-colic and lead-palsy, as occurring amongst his fellow-workmen in the capital. He assured me that neither he nor any painter of his acquaintance in Scotland had ever known either disease among painters who had worked only in Edinburgh. He ascribed the difference between London and Edinburgh to the circumstance, that in Edinburgh they are never so far from their homes as to be prevented from going thither for their meals; that they therefore take off their working-dress, or overalls, and wash their hands and faces before going to meals; but that in London, workmen are so far from home or their master's establishment, that they cannot go home for breakfast or dinner; that they therefore take their meals where they work, and do not then take the trouble of changing their dress before they feed. This appeared to be a very feasible explanation of the difference, and various master painters and journeymen have since confirmed that man's account."

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* Dr. Charcot says that in Paris gout is rare among the workmen who suffer from lead diseases.

One circumstance, which appears to point to the conclusion that lead alone does not very powerfully predispose to gout, is the fact that women engaged in white-lead manufactories, who often suffer from colic, are not afflicted with gout in like ratio with men, but the influence of sex may possibly account for this immunity.

To ascertain the manner in which lead acts, I have been led to make several observations and experiments, which appear to throw light upon the subject; these have consisted, first, in ascertaining, in several instances, the condition of the blood and urine of patients under the influence of this metal, and secondly in determining the effect which lead has upon the secretion of uric acid, when administered medicinally.

The results of the investigation in twelve cases in which the blood was examined are exhibited in the annexed Table:—

Case 1.—J. S., Organ pipe-maker. Æt. 44.	Wrist drop. Has had lead colic.	Within the last four years has experienced several slight attacks of gout.	Blood rich in uric acid. Average daily excretion of uric acid by kidneys = 4·97 grains.
Case 2.—R. T., Painter. Æt. 34.	Lead colic.	Slight threatening of gout in great toe, but no decided attack.	Blood contained uric acid. Moderate amount of uric acid in urine.

Case 3.—I. J., Labourer at lead mills. Æt. 42.	Lead colic.	Never had gout.	A moderate quantity of uric acid in blood.
Case 4.—T. C., Painter. Æt. 46.	Wrist drop. Has had lead colic.	Never had gout.	An abnormal amount of uric acid in blood.
Case 5.—J. B., Artist. Æt. 41.	Wrist drop and lead colic.	No gout until after admission into the Hospital.	Uric acid abundant in blood, and very deficient in urine.
Case 6.—C. D., Painter. Æt. 24.	Lead colic.	Never had gout.	No uric acid in blood taken during convalescence.
Case 7.—J. C., White lead labourer. Æt. 36.	Lead colic.	Never had gout.	No uric acid found in blood.
Case 8.—J. C., Painter. Æt. 46.	Colic and wrist drop.	Never had gout.	Uric acid in blood.
Case 9.—H. M., Painter. Æt. 31.	Colic and wrist drop.	Never had gout.	Much uric acid in blood.
Case 10.—W. P., Japanner. Æt. 55.	Wrist drop.	Never had gout.	Blood rich in uric acid.
Case 11.—J. B., Gasfitter. Æt. 29.	Wrist drop.	Never had gout.	Uric acid in blood.
Case 12.—W. B., Hotel porter. Æt. 34.	Wrist drop.	Never had gout.	Much uric acid in blood.

From the above table it will be observed, that uric acid is almost invariably present in the blood in cases of lead poisoning, not only in those who have previously suffered from gout, but even where no symptoms of that disease had ever shown themselves; this fact is of much importance, inasmuch as, with this exception, the presence of uric acid, save in cases of gout, is excessively rare.

I have had two opportunities of examining the effect of lead, administered as a medicine, upon the secretion of uric acid by the kidneys, and the results are not without interest. The investigation of the subject is beset with difficulties, as the cases in which the salts of lead are employed are few, and it is only now and then that the urine is capable of being accurately collected. The first set of analyses in this direction was made on a man about thirty years of age, who had been passing for several days the following amounts of uric acid: 6·03 grains, 5·23 grains, 5·59 grains, 6·69 grains, and 8·98 grains, the average for the five days being 6·50 grains. Acetate of lead, in four grain doses, made up into a pill, was then taken three times a day, and the amounts of uric acid passed the five following days were 5·33 grains, 1·84 grains, 4·58 grains, 2·87 grains; the average being 3·65 grains (the result of the third day was lost by accident). The lead was only continued three days, as some nausea and sickness were induced. About a week after, a draught containing three grains of the lead salt dissolved in water, with a few drops of dilute acetic acid, was given three times a day. During the next seven days the amounts of uric acid were: 2·67 grains, 0·24 grains, 5·08 grains, 0·23 grains, 2·95 grains, 5·55 grains, and 1·93 grains, averaging 2·66 grains. During the next period of seven days the lead being omitted, the quantity of uric acid eliminated each 24 hours was: 7·45 grains, 6·21 grains, 6·18 grains, 5·23 grains, 6·17 grains, 8·58 grains, 12·69 grains, the average being 7·50 grains.

The next patient to whom the drug was administered was a young man about 19 years of age, who, for the nine previous days, had passed the following amounts of uric acid: 7·68 grains, 7·70 grains, 6·53 grains, 6·50 grains, 8·64 grains, 5·24 grains, 5·85 grains, 6·84 grains, and 6·20 grains, averaging 6·76 grains. During the next ten days, when taking two grains of acetate of lead three times a day, the amounts of uric acid excreted were: 4·74 grains, 1·92 grains, 5·62 grains, 7·56 grains, 3·34 grains, 7·80 grains, 6·07 grains, 9·27 grains, 6·40 grains, and 6·51 grains, averaging 5·92 grains.

It will be seen from these observations that in both patients a well-marked diminution of uric acid occurred under the influence of lead. In the first case it was most marked, being more than one-half. In the second the decrease was also evident, though not so large. In both cases, however, a very peculiar phenomenon was observed, namely, that after the drug had been given for a day or so, a sudden arrest of the excretion of uric acid ensued, and the function of the kidneys then became more or less intermittent; and this it will be remembered was also found to be the case in patients suffering from chronic gout.

It would appear, therefore, that in individuals impregnated with lead the blood becomes loaded with uric acid, not from its increased formation, but from its imperfect excretion: and this is of much interest in connection with the fact that the subjects of lead poisoning are, *cæteris paribus*, more liable to be affected with gout; and, as we shall find further on, chapter XV., that those who inherit the gouty diathesis are more likely to become poisoned by the imbibition of lead.

Before concluding this subject, I may mention that I have seen several cases in which the medical administration of lead salts has caused severe attacks of gout in patients who had previously suffered from the disease; and the attacks have recurred so frequently whenever the medicine has been renewed, that there could be no doubt that the phenomena stood in the relation of cause and effect to each other.

I have as yet seen no proof that other metals possess a similar power of diminishing the excretion of uric acid; that some may, is not improbable; there are, indeed, certain statements, which appear to show that lime exerts some influence upon the development of gout. It was remarked by Musgrave, that, in Devonshire, gout became frequent when chalk was more freely employed in agriculture; and the same observation has been made in regard to the island of Crete, and other countries. It is true there are certain chemical characters common to lime and lead, and even some physiological and therapeutic resemblances may be traced; but at the same time it is not difficult to adduce strong evidence antagonistic to this view.

II.—EXCITING CAUSES OF GOUT.

Several of the causes which we have now considered will, if at any time suddenly increased, immediately excite a fit of gout; but there are others which, although potent as exciting, are altogether powerless as predisposing causes. The amount of exciting cause necessary to produce an attack depends greatly on the proneness of the patient's system to take on this action, for we often see trivial irregularities which produce no inconvenience in one individual readily excite attacks in another; and it will also be found that causes which excite an attack, unlike those which induce gout, are to a great extent dependent upon constitutional peculiarity; thus, in one case exposure to cold, in another a fit of indigestion, in a third a shock to the system, will act as the exciting agent.

Alcoholic Beverages.—One most common exciting cause of an attack is the drinking at any one time of an unusually large amount of alcoholic fluids, or the partaking, even in moderation, of champagne, malt liquors or cider which have become hard or acid. So potent, indeed, is the influence of special wines, that some cannot take a single glass of champagne without the occurrence of a fit; in some port wine acts powerfully; in others, Madeira cannot be tolerated; the cause of such differences appears to depend on peculiarities of the digestive and assimilating functions.

I have known many instances illustrating these facts, and several have been put on record. One gentleman, disposed to gout, but never having before experienced an attack in the summer season, at once caused a fit by taking six or seven glasses of champagne. Another was sensible of gouty pains in his limbs before quitting the dinner-table, after partaking of the same wine. A third brought on a most severe fit by indulging for a short time in some French wines. A fourth found his great toe hot, throbbing, stiff, and painful, when he drank port wine, even for a few days; and a fifth, subject only to slight gout, immediately felt pricking pains in the toe after taking only two glasses of port.

These instances might be multiplied almost indefinitely, for every physician who has had the opportunity of seeing this disease, could relate examples fully confirming what has been stated above. This knowledge can occasionally be made use of in diagnosis; and I believe it may be safely asserted, that *when a few glasses of wine, ale, or porter, quickly and invariably produce in any individual an inflammatory affection of a joint, such inflammation is of a truly gouty character.*

Dyspepsia is another powerful exciting cause of a gouty paroxysm, and not unfrequently we meet with patients who attribute their attacks to the use of certain articles of diet which have induced disturbance of the digestive organs, and more especially to such as lead to the production of acidity. Overloading the stomach with a variety of highly-seasoned and indigestible dishes; taking varieties of alcoholic beverages at one meal (more injurious than the same amount of any one kind), may be soon followed by a gouty paroxysm. Temporary congestion of the liver, leading to an alteration in the secretion and flow of bile, may also be attended with like consequences.

I have seen a severe attack of gout brought on by taking a hot bath soon after dinner; and Dr. Petit relates the case of a Dr. Guersent, whose joints, usually a little tender, became so troublesome after partaking of citron, as to prevent his walking. Another patient informed Dr. Petit that he was certain to bring on an attack of gout by eating "*des pommes au beurre*," especially when the fruit was unripe and acid; and the same author relates an instance of a gouty priest, who induced an attack of the disease twice in one year, by partaking of the dish called "*du veau à l'oseille;*" and, lastly, Larry asserted that he had seen a man who, whenever he drank lemonade, felt sharp pains in the joints of his lower extremities.

Cold and moisture, although, I believe, absolutely incapable of inducing the gouty diathesis, will in many subjects act powerfully in exciting a fit of gout. I have attended several patients in whom this fact was well exemplified, cases in which there could be no possible doubt as to the real nature of the malady. In one instance, a gentleman, whose case exhibited the characteristic phenomena of true gout, and whose blood was loaded with uric acid, the attacks were always excited by easterly winds, and in no way connected with appreciable disturbance of the digestive organs.

The local application of cold, even getting the feet wet, will often prove sufficient to excite a fit in gouty persons; and among the lower classes this cause is frequently operative, even when not accompanied with indulgence in alcoholic liquors.

When cold acts as an exciting cause, the effect is due at least in part to its arresting the secretion of the skin, and checking the escape of acid from the surface; but it must be remembered that a chill is necessarily accompanied by congestion of the internal organs, which may cause some functional derangement; cold also occasionally acts by its direct depressing influence upon the nervous system.

Extreme mental or bodily labour sometimes induces a fit of gout, as likewise depression from any other cause, such as late hours, especially when combined with severe study. Van Swieten relates the case of an eminent mathematician, who brought on a fit by the long and constant application of his mind to the solution of a difficult problem; and Sydenham, as before noticed, always induced gout when devoting more than his usual attention to the composition of his Tract. Violent excitement, as an outburst of passion, will act in a similar manner. Great bodily fatigue, as a long walk, is sometimes followed by a fit, and the same may result from a severe blow, fall, or other injury; many examples are on record in which fractures of limbs, dislocations of joints, surgical operations, have been followed by an attack of the disease. Local injury not only acts in exciting gout, but frequently determines the situation in which the inflammation will show itself; thus, injury to the knee or ankle will usually cause these joints to be primarily affected, although the great toe or some other part may subsequently become implicated.

Hemorrhage may act as the exciting cause, and the effect is then probably due to nervous depression. I have seen a first fit of gout produced by copious hematemesis; by loss of blood following the extraction of a tooth; by epistaxis and other forms of hemorrhage; and Dr. Todd mentions a case in which gouty attacks had been several times brought on after venesection. On the other hand, it is not uncommon to find the suppression of an ordinary discharge of blood, as the sudden stoppage of the catamenia, immediately followed by a paroxysm. M. Duringe relates the case of a lady in whom the cessation of the catamenia, caused by a violent fright, was followed by several attacks of gout, which ceased when the patient again became regular. Cases illustrative of the effects of the suppression of an habitual hemorrhoidal discharge are by no means uncommon.

The depression of the system caused by any other exhaustive disease will occasionally excite a fit of gout, and numerous instances arising from boils and carbuncles have come under my notice.

In concluding this part of our subject I may remark that it appears that all causes leading either to an increased formation of acidity, or its defective elimination by the skin, and all causes suddenly lowering the nervous system, have a powerful influence in exciting an attack of gout in subjects already predisposed to it.

CHAPTER IX.

PATHOLOGY OR NATURE OF GOUT:—EVIDENCE OF A CLOSE RELATION BETWEEN GOUT AND URIC ACID—CHARACTERS AND COMPOSITION OF URIC ACID AND ITS SALTS—PRODUCTS OF ITS METAMORPHOSIS UNDER DIFFERENT CIRCUMSTANCES—ITS OCCURRENCE IN DIFFERENT CLASSES OF ANIMALS—ITS PHYSIOLOGICAL AND PATHOLOGICAL RELATIONS—OPINIONS OF THE ANCIENTS ON THE NATURE OF GOUT—CULLEN'S OBJECTIONS TO THE DOCTRINE OF THE HUMORAL PATHOLOGISTS, AND HIS OWN VIEWS ON THE SUBJECT—MURRAY FORBES'S THEORY—OPINIONS OF SIR C. SCUDAMORE, SIR H. HOLLAND, DR. BARLOW, DR. GAIRDNER, AND OTHERS—AUTHOR'S OWN VIEWS ON THE NATURE OF GOUT—EXPLANATION OF THE GOUTY DIATHESIS AND PREMONITORY SYMPTOMS—EXPLANATION OF THE PAROXYSM AND VARIOUS PHENOMENA CONNECTED WITH THE DISEASE.

HAVING passed in review the phenomena ordinarily presented by gouty subjects, at least by those labouring under the more typical forms of the disease; having also ascertained the peculiar alteration of the blood and urine, and the morbid changes exhibited by the different tissues affected by gouty inflammation; and lastly, having studied the causes which act most powerfully both in predisposing to and exciting the malady, we now enter upon a very difficult investigation, the determination of the pathology or true nature of gout.

From a perusal of the preceding chapters, and more especially of those which relate to the altered composition of the blood and the chemical characters of both the external and the internal deposits which are found in gouty subjects and the peculiarities exhibited by the urine, the reader cannot fail to have remarked, whatever may have been his previous views of the pathology of the malady, that a very intimate relation exists between uric acid and the disease in question; such being the case, it will be advantageous to give a slight sketch of the nature and composition of this acid, and its relation to the organism in the different classes of animals, and under the varying circumstances of health and disease.

Uric acid, or lithic acid,* as it is sometimes called, occurs, when perfectly pure, in small white glistening plates, consisting of flattened rhombic crystals, so fine as to give it the appearance, to the naked eye, of an amorphous powder; but when examined by the microscope, its crystalline structure is at once recognised, and the forms it assumes are depicted in Plate V., fig. 5. When separated from the urine of serpents and birds, it is quite white; but when procured from human urine, it has usually a yellowish or red tint, depending on the great affinity possessed by this acid for colouring matters, and its power of carrying them down when precipitated from any coloured fluid. The solubility of uric acid in water is extremely limited; it requires 18,000 times its weight of cold water to dissolve it, in boiling water it is more soluble, dissolving in about 1800 parts. Although possessing the chemical properties of an acid, its watery solution does not give the reaction to litmus paper. Uric acid is insoluble in alcohol or ether, somewhat more soluble in dilute hydrochloric acid than in water, and pretty freely soluble in strong sulphuric acid, from which it is again separated on dilution with water. In many saline solutions uric acid dissolves readily, as, for example, in fluids containing alkalies and their carbonates, for urates of these bases are then formed,—

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* Uric acid was first discovered in urinary calculi and urine by Scheele in 1776; it was called lithic acid by Morveau, but afterwards named uric acid by Fourcroy, by which designation it is commonly known at the present day.

salts more soluble than the acid itself. Uric acid is also rendered more soluble by means of the phosphate or bi-borate of soda; to the former salt, which is naturally strongly alkaline, it is found to impart an acid reaction, a result arising from the formation of the urate of soda, and the simultaneous production of the acid bi-phosphate of soda.

The composition of uric acid or hydric urate is represented by the formula—

$$C_5\ H_4\ N_4\ O_3.$$

The salts of uric acid which possess most interest to the physiologist and pathologist, are

Bi-urate of Soda ($C_5\ H_2\ N_4\ H\ O_3\ Na$), a salt existing in urine and gouty blood, crystallising in prismatic needles, very sparingly soluble in water.

Bi-urate of Ammonia ($C_5\ H_2\ N_4\ O_3\ H\ (NH_4)$), constituting almost entirely the semi-solid urine of serpents and birds, and crystallising in rounded masses with projecting spiculæ or needles; even less soluble in water than the soda salt.

Bi-urate of Potash ($C_5\ H_2\ N_4\ O_3\ HK$), which is twice as soluble as the Ammonia salt.

Bi-urate of Lithia ($C_5\ H_2\ N_4\ O_3\ H\ Li.$), a salt very much more soluble than the above.

The neutral urates of these bases, with the exception of those of ammonia, can be artificially obtained, but, as they are decomposed and converted into bi-urates by the action of carbonic acid, which abstracts half the fixed base, they cannot exist in the fluids of the animal body, and possess comparatively little physiological or pathological interest.

Uric acid, when acted upon by oxidising agents, is disintegrated, and the nature of some of its decompositions is of considerable interest; thus, when boiled in water with the puce-coloured oxide of lead, the products are urea, oxalic acid, and allantoin, the latter a principle contained in the allantoic fluid of the cow. Such a metamorphosis often occurs in the animal economy; Wöhler, for example, found that when a solution of uric acid was injected into the veins of a dog, oxalic acid appeared in the urine; in urinary calculi from the human subject alternate layers of urate of soda and oxalate of lime are often seen, and in the urine of patients usually giving rise to a deposit of urates, slight circumstances, as changes of weather influencing the skin, and differences of diet, will cause the urates to be suddenly replaced by oxalate of lime.

When uric acid is submitted to the action of nitric acid, alloxan and alloxantine are formed, and with the addition of ammonia, the beautiful colouring matter murexide can be obtained, the production of which forms so valuable a test of the presence of the acid.

The physiological and pathological relations of uric acid, as far as they are at present known, may be thus shortly enumerated. It is a constituent of the urine of the healthy human subject, and the daily amount excreted by the kidneys may be estimated at about eight grains. It is probably contained in the merest traces in healthy blood. It has likewise been shown by Scherer to be contained in the spleen, and by other observers in the liver and lungs. In the urine of many other animals it is a normal constituent, sometimes existing in small amounts, sometimes forming the chief ingredient of the excretion. It appears to exist in minute proportions in the urine of the graminivorous mammalia, as the ox and cow, as asserted by Fownes, Bödeker, and Brücke, and the calf according to Wöhler; in the carnivorous mammalia it is usually present in much greater quantities than in the graminivorous, though less than in man; the correct estimate of uric acid in these animals is attended with much difficulty, and when opportunities of making the examinations occur, the urine can scarcely be considered to be in a natural state, owing to the influence of confinement. Uric acid has been discovered by different observers, especially by Hieronymi and Vauquelin, to be a constituent of the urine of the lion, tiger, leopard, panther, bear, hyena, wolf, and dog; but in the pig's urine it has not yet been found.

In the urinary secretions of birds, it is a very large and constant constituent, forming the principal ingredient of the semi-solid white substance which is seen to invest their excrements. When chemically examined, this white matter is found to consist of bi-urate of ammonia, and under the microscope is observed to be composed of minute spherical or oval masses; the same appearance is exhibited by the urine of all birds, and the size of the masses appears from my observations to be very similar, whether derived from the largest species of birds, as the ostrich, or the smaller kinds, as the canary. These oval masses are crystalline, depolarise light, exhibit lines radiating from a centre, with frequent wedge-shaped indentations. The renal secretion of reptiles and many of the invertebrata exhibits similar characters. I may remark that in birds the semi-solid urine seems to contain little else than the bi-urate of ammonia combined with water; no trace of urea is ordinarily present, but it is asserted by Coindet to be a constituent of the excretion of carnivorous birds. Guano, which is the excrement, or rather the urine of sea birds, is usually rich in uric acid.

In the urine of reptiles, uric acid is an abundant ingredient; the urine of the boa constrictor and python forming the chief source of the uric acid of commerce. In the ophidians, as in the case of birds, almost the whole mass of the urine consists of bi-urate of ammonia, no urea being present.

The urine of most saurians is rich in bi-urate of ammonia; it has been found in the crocodile, lizard, and iguana. In the chelonian reptiles, as the tortoise and the turtle, it is likewise present.

The different statements which have been made with reference to the urine of the tortoise are easily explained. One observer, for example, has asserted it to be rich in urate of ammonia; another, free from this salt; the discrepancy evidently depends on the state of the animal in relation to food: when a tortoise has not taken nourishment for months, as in the early spring, I have found the urine usually clear and rich in urea, but when nourishment is freely taken, the urine becomes creamy in consistence, and contains, in addition to urea and hippuric acid, a large amount of urate of ammonia.

In fish the composition of the urine has been little studied, but some observers have noticed the presence of uric acid; probably it resembles that of the chelonian reptiles.

In the invertebrata the presence of uric acid is nearly constant; it has been discovered in the silk-worm, butterfly, and house-fly, also in the moth, caterpillar, grasshopper, cricket, common and Spanish beetle, and many species of Meloë; indeed it is probable that the nitrogenised excretion of invertebrate animals is chiefly in the form of urate of ammonia.

From the above remarks it will be observed that the occurrence of uric acid is very constant throughout the animal kingdom, although the proportion in which it is thrown out in relation to other nitrogenised compounds is liable to extreme variation, as it sometimes forms the sole nitrogenised excretion, at other times a mere indication of its presence is all that can be discovered in the urine.

The amount of uric acid excreted by the human subject is liable to much alteration, arising not only from the presence of disease, but also from circumstances quite compatible with the existence of perfect health. It is essential, however, that we should bear in mind that the indication afforded by the secretion of this acid cannot always be taken as an index of the quantity formed in the system, for the kidneys may lose their power of eliminating it, even when it exists in abnormal proportions in the blood; a fact of much importance in the pathology of gout.

Among the circumstances especially influencing the amount of uric acid, at least in the oviparous animals, may be mentioned the character and amount of the food, the time of its exhibition, and the perfection of its assimilation by the digestive organs. That the formation of uric acid is much altered by the nature of food is made evident by the result of some experiments made by Boussingault, in which he ascertained that ducks fed with different substances excreted varying amounts of this acid in the twenty-four hours. For example—

When no food was administered, the quantity thrown out was	4·163	grains.
When balls of clay were given the amount was also	4·163	,,
Under a diet consisting of gum	4·412	,,
When casein was given	162·4	,,
Under a gelatine diet	157·08	,,
Ditto, in another trial	203·28	,,
Under a diet consisting of fibrine	138·6	,,
Ditto, of flesh	291·0	,,

Although Boussingault's results show that the uric acid is derived mainly from the nitrogenised food which is administered, less than five grains being excreted by these animals when fasting or when substances containing non-nitrogenised ingredients were given, still we have abundant proof that animals living on a vegetable diet will eliminate a considerable amount of uric acid. A tortoise, for instance, feeding on lettuces throws out semi-fluid urate of ammonia in considerable amounts, doubtless derived from the nitrogenised principles contained in the plants which these animals devour in great quantity.

Lehmann's trials on his own person point to a similar result, but at the same time indicate that in the human subject the nature of the food influences the secretion of uric acid, much less than that of the urea. By observation he found that he passed in the twenty-four hours*:—

On a strictly vegetable diet	15·5 grains of uric acid.
On a mixed diet	17 " "
On a strictly animal diet	21·5 " "

It seems probable that if the diet is only sufficient to keep up the proper nutrition of the body, the amount of uric acid would be, *cæteris paribus*, the same, whatever the nature of the diet, assuming however that the food is of a wholesome character, the stomach in a condition to digest it completely, and the individual in the enjoyment of perfect health.

Any circumstance leading to imperfect digestion and assimilation, whether it depends on the nature of the food, or the condition of the assimilating organs, may at once alter, not only the absolute formation of uric acid, but likewise its relation to the other solid ingredients.

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* It will be observed that Lehmann secreted an amount of uric acid far above the average we have adopted; this he accounts for by stating that he was labouring under some softening of the pulmonary tissue.

Lehmann, for example, found the ratio of uric acid to the urea in a normal condition was as one to about twenty-eight, and to the rest of the solid matter of the urine as one to sixty; but in indigestion, the uric acid was to the urea as one to about twenty-five, and to the rest of the solids as one to about forty-six.

The relation of the uric acid to food is also well shown by the experiments of Dr. H. Bence Jones; but these indicate rather the immediate effect of diet than its absolute influence, and show that during the time the food is undergoing the process of digestion the amount of uric acid eliminated by the healthy subject is at its maximum.

Before taking food, the urine was of sp. gravity 1024, and 1000 grains yielded 0·049 grains of uric acid.

After animal food, the urine was of sp. gravity 1027, and 1000 grains yielded 1·022 grains of uric acid.

After vegetable food, urine sp. gr. 1025, and 1000 grains yielded 1·010 grains of uric acid.

It is a matter of extreme difficulty to discover the many causes which affect the formation and secretion of uric acid, and before we can hope to throw much further light upon the subject many new and extended investigations are required.

It was assumed by Liebig that the function of respiration possessed much influence, and in proof of this hypothesis the fact was brought forward that the carnivorous mammalia excreted very little uric acid, whereas ophidian reptiles living on similar food, threw out enormous quantities of the same acid. In the former class of animals the respiratory function is active, and consequently the amount of oxygen consumed is very great, whereas in the latter it is at an exceedingly low ebb.

The chemical explanation of this action of oxygen was very simple, and accorded well with the known influence of oxidising agents in breaking up uric acid into less complex organic compounds, especially urea; but unfortunately for this theory, at first sight very attractive, many facts can be adduced which at once show its fallacy; for we have only to compare the character of the urinary secretion in birds and insects with that of reptiles to be convinced of its utter inefficiency to explain the phenomenon. The urine of birds and insects chiefly consists of urate of ammonia, yet their respiratory function is extremely active, and the amount of oxygen which they consume, compared with the weight of their bodies, is perhaps greater than in any other class of animals.

In investigating the amount of uric acid secreted in disease, too many other disturbing causes besides the mere alteration of the respiratory function are at play, to allow us to lay much stress upon the results; as a rule, however, we may say that in febrile and inflammatory affections there is an augmentation, more especially when the liver or spleen, or any organ connected with the portal circulation, is implicated.

The condition of the skin has generally been supposed to affect the secretion of uric acid, an opinion supported by the appearance of deposits of urates in the urine when a patient is under the influence of a cold; as likewise by the frequent occurrence of urinary calculi, composed either of this acid or its derivatives, in the eastern counties of England, where the influence of the bleak north-east winds is keenly felt. Possibly any alteration in the function of the skin may influence the formation of uric acid, but its chief effect is exerted upon the solubility of this acid in the urine. Suppressed perspiration is immediately followed by an increase of urinary acidity, and the precipitation of the uric acid either in the form of urate of soda or in a free and crystalline state.

Exercise probably influences the formation and excretion of uric acid, but its exact effect has not yet been clearly defined. Lehmann found that when under active exertion, the ratio of uric acid to urea in his own urine was much lessened; for example, when at rest, it was as one to thirty-eight; but after considerable exercise as one to seventy-seven. Some observers, however, have found an increase of uric acid produced by exercise; the evidence on this subject must therefore be regarded as discrepant.

Having given a résumé of the more important facts concerning the formation and excretion of uric acid in the different classes of animals, and in the human subject under varying circumstances, we are in a position to consider and discuss the numerous views which have been held from time to time of the pathology of gout.

We have already had occasion to observe that the ancient physicians were acquainted with most of the phenomena, and likewise speculated on the nature of the disease; but being ignorant of the changes which ensue in the fluids and tissues of the body, they had no opportunity of arriving at its true pathology.

The ancients were chiefly humoralists, and considered gout to be produced by some morbid alteration of the blood, but its nature was differently regarded by different writers; some considering it due to the presence of phlegm, others to bile, and others to a mixture of these fluids; chalk stones were always looked upon as exudations and concretions of those impurities. The ideas on this subject entertained by some of the principal authors, as Galen, Aretæus, Cælius Aurelianus, Alexander, Aëtius, Paulus Ægineta, and Demetrius Paleologus, are sufficiently detailed in the introductory chapter; as likewise the opinions held by the Arabians and other physicians up to the latter half of the present century, including Avicenna, Rhases, Serapion, Hoffman, Coste, &c.

In the latter half of the last century, Cullen became the great opponent of the ancient humoral doctrine, and, in his work on the "Practice of Medicine," brought forward many arguments which were of themselves powerful, but made still more so by the weight of his authority: the substance of these arguments, which embody the chief objections made by subsequent anti-humoralists, may be thus summed up:—In the first place, he urges that there is no evidence of any morbid matter being present in persons disposed to gout; and that there are no experiments or observations which show that the blood or secretions of gouty subjects are in any way different from those of other persons; that previous to attacks of gout there are no signs of any morbid state of the fluids, and the disease generally attacks those who habitually enjoy the most perfect health. Cullen allows, however, that at certain periods of the disorder, a peculiar matter appears in gouty patients, but this, he thinks, occurs in a few instances only, and after the disease has subsisted a long time, and he looks upon such an occurrence as the effect and not the cause of the malady. Furthermore, although he says that there are certain articles of food which when indulged in seem to excite gout, yet he considers that they do not operate by affording the material cause of it, but in some inexplicable manner.

From these considerations, Cullen concludes, first, that there is no proof of any morbid matter being the cause of gout.

In the second place, he looks upon the suppositions concerning the particular nature of the morbid matter as too vague and contradictory, and many of them as too inconsistent with chemical philosophy and the laws of the animal economy, to allow us to conclude that any such principle exists.

Thirdly, he considers that the idea of a morbid matter being the cause of gout is not consistent with the phenomena of the disease, particularly with its frequent and sudden translation from one part to another.

Fourthly, he agrees that if any morbid matter does exist, its operation should be similar in the several parts which it attacks; whereas it seems to be different, exciting inflammation in the joints, but acting as a sedative and destroying tone in the stomach.

Fifthly, he looks upon the non-contagiousness of the disease as favouring the idea of its being unconnected with the presence of a peccant matter in the system. In explanation of this remark, it must be remembered that, prior to Cullen's time, there were many who thought gout contagious, and instances supposed to favour such views are to be found in many old authors, as Boerhaave, Van Swieten, and others.

Sixthly, he thinks that the fact of the disease being hereditary is no proof of its humoral origin, for he argues that most hereditary diseases do not depend upon the presence of any morbid matter, but upon a particular conformation of the body, transmitted from the parent to the offspring; and this he says applies particularly to gout. He also asserts that hereditary diseases depending on a morbid poison, always appear earlier in life than is usual with gout.

Seventhly, he states that the humoral view of the disease has hitherto not suggested any successful method of cure, but has sometimes led to injurious treatment.

Lastly, Cullen considers the idea of the presence of a morbid principle in gout both superfluous and valueless.

After having urged these numerous objections against the humoral pathology of the disease, most of which can be shown to be devoid of weight at the present time, and many absolutely erroneous, Cullen proceeds to enunciate his own view of the nature of gout, a view which, in a somewhat modified form, has found numerous supporters even up to the present time. Arguing from the statements, that males are especially affected with gout, and that those of the opposite sex who suffer from it are usually robust and of full habit, that eunuchs are seldom afflicted with it, and that the disease attacks robust men with large heads, Cullen arrives at the conclusion that gout depends on a peculiar conformation, and more especially on an affection of the nervous centres, in which he thinks the primary moving powers of the whole system are lodged. He looks upon the exciting causes of the disease, such as intemperance, indigestion, depressing influences, and cold, as acting directly upon the nervous system, and considers the stomach, an organ so universally sympathising with the rest of the body, as most frequently and most considerably implicated; an opinion he deduces from the fact that symptoms of dyspepsia generally precede an attack, and many of the exciting causes of a paroxysm act first upon the stomach, and that in retrocedent forms of the disease this organ is commonly affected.

From these premises, Cullen forms his view of the pathology of gout, which is thus expressed in his own words:—

"In some persons there is a certain vigorous and plethoric state of the system which, at a certain period of life, is liable to a loss of tone in the extremities. This is in some measure communicated to the whole system, but appears more especially in the functions of the stomach. When this loss of tone occurs, while the energy of the brain still retains its vigour, the *vis medicatrix naturæ* is excited to restore the tone of the parts: and accomplishes it by exciting an inflammatory affection in some parts of the extremities. When this has subsisted for some days, the tone of the extremities and of the whole system is restored, and the patient returns to his ordinary state of health.

"This is the course of things in the ordinary form of the disease, which we name the *regular gout;* but there are circumstances of the body in which this course is interrupted or varied. Thus, when the atony has taken place, if the reaction do not succeed the atony continues in the stomach or perhaps in other internal parts, and produces that state which we have, for reasons now obvious, named *atonic gout.*

"A second case of variation in the course of the gout is, when, to the atony, the reaction and inflammation have to a certain degree succeeded, but from causes either internal or external, the tone of the extremities, and perhaps of the whole system, is weakened; so that the inflammatory state, before it had either proceeded to the degree, or continued for the time requisite for restoring the tone of the system, suddenly and entirely ceases. Hence the stomach, and other internal parts relapse into the state of atony; and perhaps have this increased by the atony communicated from the extremities: all which appears in what we have termed *retrocedent* gout.

"A third case of variation from the ordinary course of gout is when, to the atony usually preceding, an inflammatory re-action fully succeeds, but its usual determination to the joints by some circumstances prevented; and is, therefore, directed to an internal part, where it produces an inflammatory affection, and that state of things which we have named the *misplaced* gout."

Most of the dogmas enunciated by Cullen are capable of being entirely disproved at the present day, for it can be shown that a morbid matter is *constantly* present in all cases of true gout, not only during the inflammatory stage, but even before the occurrence of the attack, and consequently the first statement of Cullen is completely erroneous. Again, the very nature of the morbid matter can now be accurately defined, and its composition clearly demonstrated. The objection that the phenomena of the disease are not consistent with the supposition of their being caused by the presence of a morbid matter, has likewise little weight, for we know that certain poisons select particular parts of the economy upon which to exert their force. Atropine, for example, peculiarly affects the pupil of the eye, as well as the mouth, throat, and skin; strychnia acts upon the spinal cord: the poisons of various eruptive fevers also make particular selections,—that of scarlatina implicating the throat, skin, and kidneys, and that of rubeola the skin and mucous membranes. The argument that in one part, as a joint, gout acts as a stimulant, in another, as the stomach, as a sedative, can have little or no weight with any one conversant with pathology, for inflammatory action is usually accompanied with diminution or destruction of the proper functions of the organ affected.

The fact of gout not being contagious would at present be considered no proof that the phenomena it displays are incapable of being produced by some morbid element in the blood, and therefore the fifth objection of Cullen falls to the ground; and the sixth, founded on the assumption that most hereditary deseases depend on a particular conformation of the body, cannot have much weight, for we know that many hereditary affections are most indubitably connected with the presence of a specific poison in the economy.

The remaining objections need scarcely occupy our attention; the fact of a humoral view of the pathology of gout not having led to an improvement in its treatment, might with equal justice be urged against many other views; and pathologists of the present day must feel the want of an explanation of the phenomena of the disease more satisfactory than that afforded by Cullen or any of his followers.

In 1793, a small work was published by Mr. Murray Forbes, entitled "A Treatise upon Gravel and Gout," which is remarkable for containing views on the chemical nature of these diseases, not unlike those entertained by modern pathologists. Mr. Forbes, for example, asserts that lithic (uric) acid, as it exists in the urine, must be present in the blood, although he confesses his inability to discover it. His words are, "its frequent deposition in different parts of the body affords indisputable testimony of its being contained in the general fluids;" and as this deposition occurs in certain circumstances, and more especially in gout, he makes the inquiry whether that disease may not arise in consequence of the concreting matter being redundant, or whether the coincidence is merely accidental. Mr. Forbes goes on to show the connection between gout and gravel, as exhibited in the similarity of the constitutions in which they occur, and the remedies best suited for the two diseases, comparing the depositions in the tendinous structures to the formation and separation of gravel from the urine. It should be borne in mind that this view was entertained before the discovery of the real composition of gouty deposits, which accounts for the error in assuming that they contained free uric acid and not urate of soda, and of the precipitation or deposition being ascribed to the liberation of the uric acid by the aid of another acid introduced into the economy. This theory, although somewhat erroneous, approaches closely to the truth; and, considering the time when it was promulgated, is characterised by great perspicuity, and was the first to give real importance to the humoral doctrine of the disease.

Notwithstanding the arguments brought forward by Murray Forbes, and the increased weight given to them by the subsequent discovery by Wollaston in 1797 of the composition of gouty tophi, the doctrines of Cullen continued to hold sway, at least in a modified form; and the late Sir C. Scudamore was inclined to favour the view which attributes the disease to a species of plethora, rather than to any alteration in the composition of the fluids; still he confessed to many difficulties in explaining the various phenomena of gout on such a hypothesis, and more especially the occurrence of chalk-stones, which he allowed were never seen except in cases of true gout; but he thought these deposits so rare, that their presence could not be employed as a basis for the construction of a general theory of the disease, and much less could the matters composing them be looked upon as its proximate cause. As regards their rarity, he remarked he had only found them forty-five times in five hundred cases of gout, and in several of these cases many years had elapsed before any traces of such concretions manifested themselves. Scudamore thought that so large a proportion of persons could not pass through life under the martyrdom of the disease, remaining wholly free from all evidence of the concretions, if any essential relation existed between uric acid and gout. He likewise considered that we had no proof of the existence of uric acid in the system independent of secretion, and that, even if it were present, there was no apparent cause why it should not always be secreted by the kidneys; he was of opinion that in the cases where it was thrown on the joints or other distant parts, the capillary vessels of the structures affected with gouty inflammation acted, in a greater or less degree, vicariously to the secreting vessels of the kidneys: he also stated that in several cases of extensive deposits in the hands and feet, he had by repeated experiments found a deficiency, and sometimes almost total absence, of uric acid in the urine. Having attended Sir Charles professionally in the latter years of his life, I have reason to know that his opinion on the proximate cause of gout became much altered, and he was inclined to look upon the disease as intimately connected with the abnormal presence of uric acid in the system.

Dr. Barlow, in an article in the Cyclopædia of Practical Medicine, also supports the theory that gout is closely connected with vascular plethora, and states that a paroxysm of gout can be regarded only as a constitutional disturbance of an inflammatory character, attended with local inflammation of a peculiar kind in one or more joints, running a determinate course, and followed generally by a restoration to health, after the earlier attacks, in a few days. More recently, however, in his Manual of Practical Medicine, the author appears to have considerably altered his opinions on the pathology of gout.

Dr. Gairdner, some years since, advanced a hypothesis in some respects resembling those above enumerated; he believes that a general state of vascular plethora of the great chylopoietic organs is always met with in gout, and that a varicose state of veins of the lower extremities invariably precedes an impending fit; that the heart is oppressed with a flood of returning venous blood, associated with an impure condition of this fluid from the non-elimination of urea and urates, and probably of biliary constituents. He however advances a step further than the authors before quoted, and thus describes his idea of the pathology of the gouty seizure:

"Venous congestion I consider the first condition essential to the formation of the gouty diathesis. It is no new observation; it is found interspersed through the writings of all former authors. Even those who adopt explanations inconsistent with such a state of things, notwithstanding admit it. This state of the blood was first clearly enounced as the great cause of gout by Galen, whose opinions have continued to influence the minds of succeeding physicians in a greater or less degree, to the present day. The truth of the fact being, I imagine, unquestionable, it will always continue to embarrass the doctrines of those who advocate opinions with which it is incompatible. But the great venous canals of the body, as well as the larger arterial vessels, are endowed with a resiliency, which enables them to struggle well against the flood of returning blood. This fluid, then, is compressed between two opposing forces, that, namely, which is derived from the heart and arterial system, urging it forward on its course; and, on the other hand, the antagonistic resistance of the great veins leading to the right auricle. Under this compression I believe that the vessels give way, and a true hemorrhage is occasioned in the part affected. If the rupture takes place in a minute capillary carrying the serous portion of the blood only, œdema is the consequence; but if the burst vessel be one carrying red blood, a true ecchymosis is formed."

And again: "It will surely be admitted that the capillary and nutriment vessels, distributed on the extreme and sentient fibrillæ of the nerves, are affected in the same manner as the larger venous trunks. I believe these distended capillary vessels are the real seat and cause of the painful phenomena of gout. Is it not credible that such vessels, dilated so as to admit fluids for which they were not intended, and bound down by the firm fasciæ, in which gout has its usual seat, may give rise to much suffering?"

It will be no more difficult to refute these views of the nature of gout than the one advanced by Cullen. Let us take, for example, Dr. Gairdner's hypothesis, which is the most comprehensive of the three and includes the rest, and examine it somewhat in detail. First, as regards the general state of vascular plethora of the great chylopoietic organs, which he says is always met with. In gout, especially if acquired, and occurring in robust subjects, congestion of the abdominal organs is often present, and there is a fulness of the right hypochondrium, sluggish bowels, defective excretion of bile, and dyspepsia; but that these symptoms are constant I much question, and in fact can bring forward numerous cases in which there was no appreciable congestion of the organs connected with the portal system; such absence is more commonly seen in spare subjects and in those who strongly inherit the disease, and in whom we shall find, as we proceed further, that the kidneys rather than the liver are defective in their functions.

On the other hand, if congestion of the digestive organs be intimately connected with, and even a necessary antecedent of, the gouty paroxysm, how does it happen that in diseases in which these organs become loaded with blood, and in which congestion is so prominent a symptom, the sufferers are not more frequently afflicted with visitations of gout? According to Dr. Gairdner, such subjects have all the necessary elements for the production of the hemorrhage of the minute vessels of the extremities; moreover, every serious disease of the heart, when that organ has become so defective in its action as to allow of congestion of the whole venous system, should, according to the above view, give rise to a paroxysm of gout. That this is seldom the case, all medical experience will confirm.

The veins leading from the inflamed part certainly become turgid at the time of the fit, and so constantly is this the case, that turgidity is one of the peculiar characteristics of gouty inflammation, but I believe it to be the effect of some prior mischief within the joint.

Next, as to the occurrence of hemorrhage in every fit of gout, regarded by Dr. Gairdner as the cause of the local affection, (an explanation which, he thinks, may startle the reader by its novelty,) it may be urged with fairness that the author brings forward no proof of the occurrence of hemorrhage in any case, and hence it may be presumed he has never seen the ecchymosis alluded to; and with regard to the colourless hemorrhage or serous exudation, this occurs in numerous affections besides gout, and can be readily accounted for without assuming the very questionable existence of vasa serosa.

As the reader will perceive, by referring to the chapters on morbid anatomy, my available opportunities of examining parts affected with gout have been very numerous, but I must confess never to have seen the slightest proof of Dr. Gairdner's assertion; on the contrary, other appearances have invariably been observed which are completely pathognomonic of gouty inflammation.

If space permitted I might enter into the consideration of the opinions of many other physicians who have within the last century written upon gout, but as it is I can do little more than enumerate the names of some of these authors. In this country, Drs. Parkinson, Wollaston, and Sir E. Home, have advocated the doctrine of the humoral pathologists, and considered that a close relation existed between gout and the presence of uric acid in the blood. Others, however, as Drs. Parry and Sutton, looked upon the disease as either dependent on some peculiarity of the circulating system, or as intimately connected with disorder of the digestive organs.

On the Continent, especially in France, the views held by the most eminent writers, as Barthez and Guilbert, have been extremely vague; the former scarcely venturing upon any hypothesis, but contenting himself with regarding gout as dependent on a peculiar disposition of the system, combined with weakness of the affected parts: the latter, explaining the phenomena by the supposition that under the influence of certain causes, which impair the functions of digestion, impede the action of the skin, and give rise to a condition of plethora, a matter intended to be excreted is retained, and the lymphatic system thus becomes loaded with this, the *materies morbi.*

Other French physicians, as Cruveilhier and Dr. C. Petit, look upon gout as intimately connected with the presence of uric acid in the system, and both authors, who wrote prior to the actual proof of its existence in the blood, employ powerful arguments in support of their opinions.

Before offering to the profession my own views upon the nature of this disease, I cannot refrain from alluding to the conclusions arrived at by a physician who appears to have taken a deep and comprehensive survey of all the data which had been established at the time his article was penned; I refer to those of the late Sir Henry Holland, who in his Medical Notes and Reflections devotes a chapter to the subject, well worthy of attentive perusal.

Having given a slight sketch of the different ideas of the proximate cause or nature of gout, which have been entertained both in ancient and modern times by physicians whose opinions are most worthy of esteem, and having had occasion to point out the fallacies of many of them, it now behoves me to expound the views which, from a long and attentive consideration of the varied phenomena of the disease, I have myself arrived at, and this task I will endeavour to perform in as succinct a manner as possible.

In the Medico-Chirurgical Transactions for 1848, I ventured to advance the following guarded opinion, derived from several observations on the condition of the blood and urine in gout, rheumatism, and albuminuria. "The results of these experiments on the condition of the blood and urine, prove that uric acid is not a product of the action of the kidneys, as frequently supposed, but is merely excreted from the system by these organs. They also appear to indicate that the excreting function of the kidneys with regard to the solid portion of the urine, is not a simple one, but that urea and uric acid are separately eliminated; also that one of these functions may be impaired or destroyed, the other remaining entire. It appears also probable that, as in albuminuria, the *urea-excreting* function being chiefly impaired, we find a vicarious discharge of urea in dropsical effusions; so, in gout, the *uric-acid-excreting* function being defective, chalk-like deposits are produced by a similar vicarious discharge of urate of soda.

"Gout would thus appear, at least partly, to depend on a loss of power (temporary or permanent) in the uric-acid-excreting function of the kidneys; the premonitory symptoms, and those also which constitute the paroxysm, arising from an excess of this acid in the blood, and the effort to expel the *materies morbi* from the system. Any undue formation of this compound would favour the occurrence of the disease, and hence the connection between gout, gravel, and calculus, hence also the influence of high living, wine, porter, want of exercise, and other like causes, in inducing it.

"This hypothesis also explains two facts, which have been regarded as militating against the humoral pathology of the affection, namely, its hereditary nature, and its frequent occurrence in low states of the system; for we can understand that the peculiarity of the kidney, with reference to the excretion of uric acid may be transmitted, and likewise, that when the function in question is permanently injured, it will not require an excessive formation of this acid to cause its accumulation in the blood."

These views were made public twenty-seven years since, and subsequent clinical observations have fully confirmed their accuracy; although in themselves insufficient to explain all the phenomena of gout, still, by their aid, in conjunction with other more recent investigations, I shall hope to be able to give a rational exposition of the disease.

In order to render my views concise and explicit, I shall present them to the reader in a series of propositions:

First, in true gout, uric acid, in the form of urate of soda, is invariably present in the blood in abnormal quantities, both prior to and at the period of the seizure, and is essential to its production; but this acid may occasionally exist, at least for a time, in the circulating fluid without the development of inflammatory symptoms, as in cases of lead poisoning. Its mere presence, therefore, does not explain the occurrence of the gouty paroxysm.

Secondly, the investigations detailed in the chapter on the Morbid Anatomy of Gout, prove incontestably that true gouty inflammation is *always* accompanied with a deposition of urate of soda in the inflamed part.

Thirdly, the deposit is crystalline and interstitial, and when once the cartilages and ligamentous structures become infiltrated, remains for a lengthened time, often throughout life.

Fourthly, the deposited urate of soda may be looked upon as the cause, and not the effect, of the gouty inflammation.

Fifthly, the inflammation which occurs in the gouty paroxysm tends to the destruction of the urate of soda in the blood of the inflamed part, and consequently of the system generally.

Sixthly, the kidneys are implicated in gout, probably in its early, and certainly in its chronic stages; and the renal affection, possibly only functional at first, subsequently becomes structural; the urinary secretion is also altered in composition.

Seventhly, the impure state of the blood, arising principally from the presence of urate of soda, is the probable cause of the disturbance which precedes the gouty seizure, and of many of the anomalous symptoms to which sufferers from gout are liable.

Eighthly, the causes which predispose to gout, independently of those connected with individual peculiarity, are either such as produce an increased formation of uric acid in the system, or lead to its retention in the blood.

Ninthly, the causes exciting a gouty fit are those which induce a less alkaline condition of the blood; or which greatly augment, for the time, the formation of uric acid; or such as temporarily check the eliminating power of the kidneys.

Tenthly, in no disease but true gout is there a deposition of urate of soda in the inflamed tissues.

With regard to the fact enumerated in the *first* of these propositions, namely, that the blood in gout always contains an abnormal quantity of uric acid during the attacks, sufficient evidence has been already afforded, inasmuch as it has been shown in Chapter IV., that in forty-seven patients suffering from the disease the blood contained much uric acid, and subsequently to the formation of the table, an examination of the blood of at least a hundred other patients has demonstrated the same truth. That this impregnation occurs prior to an attack, is well illustrated in the annexed cases of lead paralysis, in which the patients experienced the first fit of gout when in the hospital.

Case I., *Feb.* 15, 1859.—J. B., aged 41, an artist, engaged in painting both in water and oil colours. About ten years since felt some symptoms arising from the absorption of lead, first in the form of colic and obstinate constipation, and afterwards in the wrists. These symptoms were relieved, and he resumed his usual occupation. About three years ago he completely lost power over both his wrists, and had a severe attack of colic; he then came for the first time under my care, and by treatment was so far restored as to be enabled again to pursue his avocations. Six weeks ago, he had a return of the wrist-drop and colic, which have continued up to the present time. There is now an entire loss of power in both wrists, also considerable wasting of the extensor muscles of the fore-arms, and of the flexor muscles of the right thumb; severe twisting pain around the umbilicus, and constipated bowels, loss of appetite, and weak pulse. A very distinct blue line is seen on the free edge of the gums, both of the upper and lower jaw.

A small amount of blood, obtained on his admission into the hospital, exhibited the following characters:

Clot firm, and slightly buffed; serum, yellow, transparent and alkaline. Sp. gr. 1027 at 60° Fahr. By the thread experiment there was evidence of its containing abundance of uric acid.

Urine pale, free from deposits, and yielding scarcely a trace of uric acid when acidulated.

During his stay in the hospital this patient experienced a decided attack of gout, first in the metatarso-phalangeal joint of the left great toe, and afterwards in the corresponding joint of the right foot.

Case II., 1866.—Similar to the above: the man, a worker in lead, came into the hospital suffering from wrist-drop; a trial bleeding showed the presence of a large amount of uric acid in the serum. I gave a clinical lecture on his case, pointing out the similarity of his blood to that of a gouty subject; within a few weeks a decided fit of gout in the great toe ensued, although the patient had never experienced anything of the kind before.

That in certain instances the blood may contain an abnormal amount of uric acid without the occurrence of gouty inflammation, has been clearly demonstrated in some cases of lead-poisoning, and others will be alluded to subsequently.

In the Chapters on the Morbid Anatomy of Gout, I believe sufficient evidence will be found to convince any pathologist of the truth of the *second* proposition; for not only has proof been afforded that a deposition of urate of soda occurs in the chronic forms of the disease, but even that the slightest amount of gouty inflammation is accompanied with a similar deposit. Its presence has been discovered in a case in which only one small joint had been affected, as also in a knee-joint, known to have been but once inflamed, and that very slightly; and lastly in a case where only one attack of gout had ever occurred. This fact I wish to impress forcibly on the minds of my readers, because in the *constancy* of such deposition, lies the clue which has long been wanting: the occurrence of the deposit is perfectly pathognomonic, and at once separates gout from every other disease which at first sight may appear allied to it.

To my *third* proposition, little further need be added, as I have already stated that in very numerous instances I have found the cartilaginous and ligamentous deposits distinctly crystalline, and undoubtedly interstitial, and with respect to their long persistence when once deposited, I can bring forward strong evidence. In Case 15, Chapter VI., where only the ball of one great toe had been implicated, two years had elapsed, still the deposit was discovered; at least an equal time had elapsed in Case 13, where the knee had been but once and very slightly inflamed, yet distinct evidence of the mischief remained; in Case 16, in which only one attack of gout had occurred, there was proof that after an interval of thirteen years the cartilages and ligaments still remained infiltrated with the urate of soda. In the majority of cases the deposits probably remain during life, increasing more and more with each succeeding fit.

It is of the highest importance to establish the truth of the *fourth* proposition, namely, that the deposited urate of soda must be regarded rather as the cause than the effect of the gouty inflammation, inasmuch as it bears closely upon the pathology of the disease. There are several reasons which militate strongly against the supposition that the deposit is the effect of the inflammation; for instance, when tissues little liable to take on inflammatory action become infiltrated, but slight vascular disturbance is produced; this is especially the case with the fibro-cartilage of the ear; and, although we now and then meet with patients aware of the formation of these little nodules, who experience, in fact, a gouty fit in the ear, yet in the majority of cases attention has never been directed to the part, so slight has been the inflammation caused by the effusion, and several patients have assured me that they had noticed the existence of deposits on the cartilages of their ears some months before the first attack of articular gout occurred.

Another reason, strongly militating against the same supposition, is contained in the *fifth* proposition, to be now considered, namely, that the inflammation of gout tends to the destruction of the urate of soda in the blood of the part. The proof of this is to be seen, first, in the fact that the serum effused by the application of a blister to the inflamed skin does not exhibit evidence of containing uric acid, while the blood of the patient and the blister serum from a non-inflamed part readily show its presence; and secondly, in the peculiar manner and situations in which these depositions occur, selecting, as they do, structures possessed of slight vascularity, as cartilage, fibro-cartilage, ligament and tendon, and the surface of synovial membranes, and, even in these tissues, keeping to such portions of them as are furthest removed from the influence of blood-vessels. Thus the deposit in articular cartilage, although completely interstitial, first takes place at the free surface, and very gradually travels inwards towards the bone. The only marked exceptions I have seen to this rule have occurred in the patella, in which occasionally nodules of urate of soda are observed at some distance from the articulating surface; but we must remember that the patella is a sesamoid bone, and by no means vascular in its structure; this may probably account for the fact that Cruveilhier discovered deposits which he considered to consist of urate of soda, even within the bone itself.

We have likewise seen that on the surface of bones much altered by gout, especially the condyles of the femur, the deposit avoids contiguity with the vascular fringes of the synovial membrane; a fact first pointed out by Dr. W. Budd, and seen in the delineation of the knee-joint, in Plate III., fig. 3.

Lastly, the results of certain physiological experiments in which uric acid has been injected into the blood, as also the readiness with which it is decomposed out of the system, confirm the idea that contact with blood-vessels, more especially when in a state of inflammation, has a tendency to cause the destruction of uric acid.

It would thus appear that the gouty fit is, to some extent, a salutary process, ridding the system of much uric acid which may have been accumulating for a considerable time; but we must likewise remember that it is always attended with a certain amount of local mischief, which may or may not prove a source of subsequent inconvenience.

The truth of the *sixth* proposition has been fully demonstrated in Chapter VII., where it has been shown that with very few exceptions, in subjects who had in any degree suffered from gout, the kidneys were altered by the deposition of urate of soda, both at the ends of the pyramids and in the direction of the tubuli uriniferi; that in many instances these organs were contracted, and in almost all, an appreciable change had ensued in the cortical structure. It has been imagined long since that the kidneys are affected in gout, and Morgagni had an idea that we should find a clue to the disease in the condition of these organs.

The effect of gout in altering the renal secretion has likewise been fully proved; the uric acid excretory function is defective, and the urine often contains a small amount of albumen. The imperfection in the eliminating power of the kidneys sometimes appears to be the chief, if not the only cause of the impurity of the blood; and to show that an augmented formation of uric acid is not necessarily accompanied with an excess of it in the blood, we need but refer to the case of birds such as the turkey, fowl, and pigeon, whose blood I have examined several times and always found it free from any abnormal amount of uric acid.

The observations of Zalesky, showing that uric acid, probably as urate of ammonia, is actually formed by the kidneys, would rather strengthen my views of the connection between the condition of the renal function and the development of gout. If we assume the truth of his observations, then we must suppose that in healthy animals the urate of ammonia, as soon as it is formed, is quickly eliminated with the urine; but that in certain diseased conditions of the human subject it is retained in the renal cells and gradually becomes absorbed into the blood, where it is converted into urate of soda. We find a good analogy in the case of the liver. When there is nothing to obstruct the exit of bile from the biliary tubes, no appreciable amount of the colouring matter is found in the blood; but when from any cause the free elimination of the bile is checked, then the blood becomes speedily impregnated with it, and jaundice is produced.

There is an interesting clinical fact which I have sometimes observed which is explicable only on this view, the fact, namely, that in certain cases of advanced gout, where extensive deposits have taken place throughout the body, the patient lives on for many years, and often without any subsequent development of gouty symptoms; the urine at the same time being quite devoid of any appreciable amount of uric acid. An example of this is seen in a case in Chapter III., page 72. If uric acid were formed in the system and merely excreted by the kidneys, then, as these organs lose their functions, uric acid should go on accumulating more and more in the blood; but if, on the contrary, the kidneys are themselves the producers of this body, then, as the formative function is diminished, there would be a lessening of the acid.

The *seventh* proposition is difficult to prove, although almost every physician is accustomed to recognise a close relation between particular symptoms and the presence of certain morbid matters in the blood. We have absolute proof, derived both from physiological and pathological observation, that when the urinary secretion is completely stopped, most serious and even fatal symptoms ensue; and it is therefore reasonable to suppose, that if one or more of its constituents be retained in the blood, certain morbid phenomena would result therefrom. Some of these symptoms in the case of gout may arise simply from the presence of the special impurity, others possibly from an attempt at its deposition, and the consequent reaction. I should be inclined to regard the dyspeptic symptoms which usually precede the gouty fit as due to the former, and many of the anomalous and irregular forms of the disease which we shall hereafter more fully consider, as dependent rather upon the latter cause.

The discussion of the *eighth* proposition is of much interest and considerable importance, for if we can prove the truth of the statement that the predisposing causes are of different kinds, the one leading to the increased *formation* of the morbid matter, the other to its *retention* in the blood, we at once have a clue to the varieties of the disease, popularly known as the rich, and the poor man's gout. As it has been shown that the inflammation is invariably accompanied by the deposition of urate of soda, which may be regarded as its cause, it is evident that any circumstance which favours an accumulation of this salt in the system, and thereby paves the way for its infiltration into the articular tissues, becomes a predisposing cause, whether this arises from its augmented formation and the consequent overtaxing of the renal organs, or whether the excreting power of the kidneys be simply impeded in their normal function. It appears probable, that in the majority of cases of gout both causes are in operation; but on the other hand it is easy to conceive that either, if active, might lead to the production of the disease. In the former case the affection would be typical of the *rich*, in the latter, of the *poor* man's gout.

In the *ninth* proposition we have assumed that the infiltration of urate of soda into the tissues may take place in two ways, either by its great accumulation in the blood, or by that fluid being rendered less capable of holding it in solution; the former condition may be caused by a temporary increase in the formation of uric acid, as by aggravated dyspepsia, from partaking of very indigestible articles of diet; or by a sudden loss of the uric-acid-excreting power of the kidneys from mental shocks, severe accidents, and so forth, all of which we know to be very potent in exciting a fit of gout; the latter condition is likely to be induced by partaking of acid liquors, as particular kinds of wine, hard beer, and pickles; or by the suppressed action of the skin causing defective elimination of acid perspiration, and the consequent diminution of the alkalinity of the blood.

The serum, in which the urate of soda is dissolved, is alkaline, and this reaction is caused in part by phosphate of soda, in part by alkaline bicarbonates. In no case of disease—and my opportunities have been numerous—have I found this fluid acid, and it is probable that such a state would be incompatible with life; but there is often a marked alteration in the degree of its alkalinity, and in many cases of chronic gout it has shown a near approach to neutrality. Any diminution in the alkaline state of the serum lessens its power of holding urate of soda in solution, and facilitates its deposition, especially in tissues whose reaction is naturally less alkaline than the blood. To illustrate this experimentally, we may take a watery solution of the common phosphate of soda, and dissolve uric acid in it, but only to such an extent as to ensure the fluid remaining alkaline; the subsequent addition of a small quantity of a weak acid will cause the precipitation of urate of soda; but if the fluid is rendered acid, then uric acid will be deposited in a crystalline state.

By the adoption of these views we are enabled to explain why differences exist in the classes of exciting causes; for we have found that some of them are of the same nature as those which predispose to gout, but that others, however long their action is continued, are powerless as predisposing agents. We now see the reason of these differences; those agencies which, when in active operation, lead to a rapidly augmented formation of uric acid and the production of a fit, must necessarily, if in slower action, predispose to the affection; whereas agencies which simply diminish the alkalinity of the serum, and render the urate less soluble, cannot of themselves in any way produce the disease; thus cold, which so often excites a fit of gout, never induces the gouty habit.

We have lastly to discuss the *tenth* proposition, namely, that in no other disease but true gout is there a deposition of urate of soda in the inflamed tissues. In at least a dozen fatal cases of genuine rheumatic fever, I have examined the joints known to have been affected. Some of them, which had recently been inflamed, exhibited increased vascularity, turbidity of the synovial fluid, opacity of the cartilage, and other marks of inflammatory action; but in no one case have I seen the slightest trace of a deposit of urate of soda. Again, in numerous cases of rheumatoid or chronic rheumatic arthritis, observed both by myself and others, although the cartilages have always shown signs of much injury, from the effects of ulceration, and have often been covered with a deposit of bone earth, yet no uric acid deposit has been found. I may here state that it has been asserted that urate of soda is sometimes present in joints which had not been affected with gout during life, and one such case is related by Mr. Barwell, who exhibited a diseased knee-joint, supposed to be in this condition, before the Pathological Society; but on careful examination I found that the deposited matters, which had replaced to some extent the absorbed cartilage, consisted of phosphate and carbonate of lime, without a trace of uric acid. The late Mr. Beevor, of Manchester, assured me that he had taken a large tumour from the scalp of a young woman, having no tendency to gout, and that it had been analysed and found to consist of urate of soda. Fortunately the tumour had been preserved in spirit, and a slice was given to me, but I failed to detect the least trace of uric acid in it. I have examined the great toe joints in at least forty cases with no known gouty history, and in only two instances was uric acid discovered, and in both these in one foot only, and limited to a single spot in the cup of the first phalanx. One of these individuals was a cabman, aged forty-eight, he had granular kidneys, and had died from an injury; the other was a man aged forty-three, who died from delirium tremens; in both cases the spot was similarly situated, as represented in the annexed woodcut. I have no doubt that many persons experience extremely slight attacks of gout before the development of the affection in an acute form, and several of my patients have assured me that for years before their first severe attack in the great toe, they have felt slight periodical twinges. I am of opinion that when such twinges occur, deposition has already taken place.

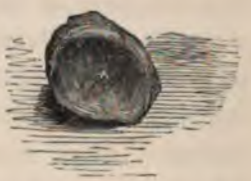

Fig. 24.*

Having enumerated and considered these propositions, we will now endeavour, by their aid, to explain certain peculiarities which are met with in the progress of gout, many of which have proved of great difficulty to pathologists. With regard to the phenomena of the fit, it is essential that there should be a prior impurity of the blood due to the presence of urate of soda, and this may be induced by the action of any of the predisposing causes of the disease; it is probable that this condition of itself is sufficient to give rise to the premonitory symptoms which are chiefly manifested in the functional derangement of the digestive and circulating organs. To excite a gouty paroxysm, however, requires the additional operation of other agencies, namely, of those by which the urate of soda is either suddenly augmented or rendered less soluble, and its crystallisation promoted in the ligamentous and cartilaginous structures of the joints. The intensity of the pain which usually accompanies a gouty fit depends upon the rigidity of the parts, or the state of tension within the joint, for it is only when the inflammation is inter-articular that it is so peculiarly intense; when confined to the structures around the joints, the pain does not appear to be more severe than in many other inflammatory diseases.

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* Fig. 24 represents the cup of the first phalanx of the great toe containing a speck of urate of soda; from a man who died of delirium tremens.

One peculiarity of gouty inflammation is the occurrence of œdema, and the subsequent desquamation of the cuticle; these symptoms are of some importance, as they are so frequent in gouty, so rare in rheumatic inflammation. An explanation has been before hinted at, namely that the œdema depends on the presence of urea in the blood, and we have seen that this is frequently the case, and we likewise know that in albuminuria, where the elimination of urea is greatly impeded, œdema is a prominent symptom; and in scarlatina, where the kidneys are so liable to be affected by the poison, desquamation of the skin is a characteristic attendant. I cannot help thinking that the above may be the true explanation; but in order to prove it beyond doubt, certain clinical and chemical observations are required which have not yet been satisfactorily made. The occurrence of chalk-stones or gouty tophi, which has so long been a stumblingblock to those who denied the existence of an altered blood, is now easily explained; *every paroxysm of gout is attended with a deposit.*

Sir Henry Holland remarks that a difficulty in the history of gout, and one not easily reconcilable with the view of the disease being dependent on a *materies morbi*, is the fact that frequently some joint is attacked with gouty pain and swelling, without any well marked symptoms to give warning of its approach; for it is necessary to explain how the matter, capable by accumulation of producing an attack, should have been dormant up to the time of the seizure, and why, latent thus long, it should suddenly show itself in the production of acute disease. These questions he confesses could not be answered at the time he wrote.

According to our view their solution is a very easy task, for we have shown that the mere accumulation of the urate is quite unequal to the production of inflammation, and that its actual deposition in tissue is essential, an occurrence which usually requires a peculiar exciting cause; and hence in many cases there may be no well marked symptoms to give warning of the approach of a fit, and hence also the poison may lie dormant for a considerable time; but when crystallisation of the salt takes place in any tissue, inflammation is suddenly lit up by its presence and a paroxysm of gout ensues.

Questions in the history of gout of much greater difficulty to solve, are the following:—

Why does gouty inflammation in its earlier attacks peculiarly select the ball of the great toe? and why, in the subsequent progress of the malady, are the affected joints more numerous?

To answer the first of these questions has been the attempt of many physicians; Sydenham says "the feet are the genuine seat of the peccant matter, which may without doubt fix itself on other parts; but in that case it is plain that either the progress of the distemper is inverted, or the patient's strength, from repeated attacks, is gradually impaired."

Boerhaave has an aphorism to this effect, that the part which gout first and regularly attacks is always the foot, and chiefly those tissues which the fluids have most difficulty in passing through, as the periosteum, tendons, nerves, membranes, and ligaments, and such as are most remote from the heart, and most pressed upon and injured. His commentator, Van Swieten, adds, that considering the difficulty with which the liquids pass through these parts, it is not very difficult to understand why gout is generally observed to commence in them, as they suffer great pressure from having to sustain the weight of the whole body, and being far removed from the heart are subjected to the action of cold and moisture, and the blood brought to them by the arteries, when returning through the veins, has the force of gravitation to overcome. The feet are also peculiarly liable to be hurt in walking, leaping, sudden falls, and accidents.

I believe there is much truth in these remarks of Boerhaave and Van Swieten, although the state of pathology at that period did not allow them to advance further in explanation of the subject.

There are many circumstances which cause the great toe to be selected for the first deposition of gouty matter; it contains, for example, in abundance, the tissues particularly prone to be affected, namely, those either of little vascularity, or nourished altogether independent of blood-vessels; it is likewise very remote from the heart, and in it the force of the circulation is at its minimum; in addition to this, the metatarso-phalangeal joint is one

Pl. IV.

Fig. 1.

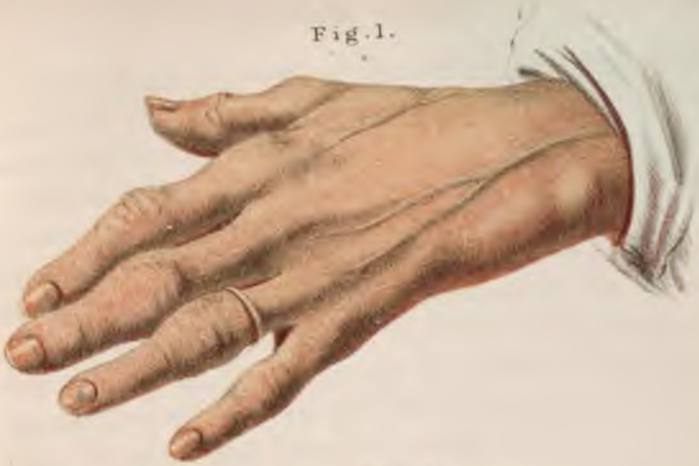


Fig. 2.

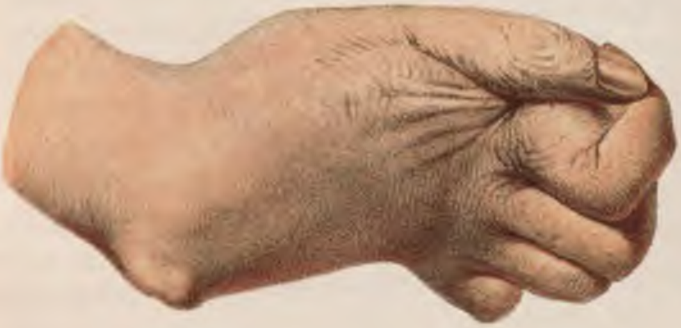
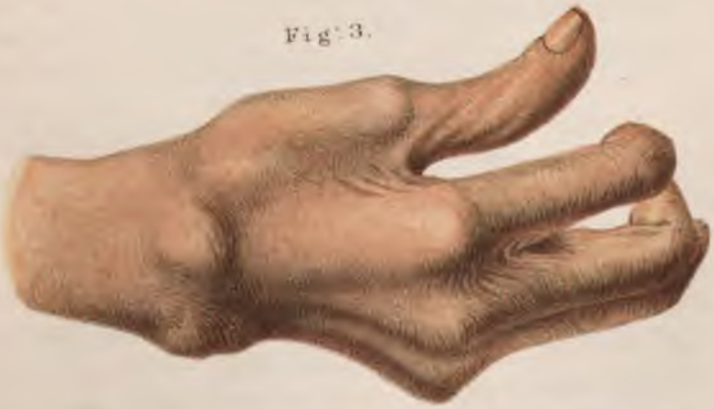


Fig. 3.



G.H. Ford

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which is liable to injury from having to support the weight of the body, and from being subjected to sudden shocks, as from false steps.

In connection with this point I may mention that in the examination of this joint in many individuals who have never experienced symptoms of gout, I have commonly found distinct evidence of injury on the surface of the cartilage, both of the head of the metatarsal bone and of the cup-like cavity of the phalanx, when these appearances were not present either in the corresponding joints of the other toes, or in any of the phalangeal articulations.

Many years since I endeavoured to obtain definite results on this point, by observing the condition of the great toe joints in twenty post-mortem examinations of subjects known not to have had gout; in six cases only were both joints found absolutely healthy; one toe was healthy in three cases; but in the remaining eleven cases both toes were affected with ulceration of the cartilage to a greater or less extent. The following tabular arrangement shows the principal points of interest :—

Case.	Sex.	Age.	Condition of Metatarso-phalangeal joint of great toe.
1.	Female .	67	Right, healthy. Left, slight ulceration in cartilage of cup with a small yellow spot (fat).
2.	Female .	53	Right, faint ulceration in cartilage of cup. Left, fainter.
3.	Female .	62	Right, trace of ulceration in cartilage of cup. Left, scarcely a trace.
4.	Female .	64	Right, faint ulceration. Left, faint ulceration.
5.	Female .	24	Right, healthy. Left, healthy.
6.	Female .	61	Right, very slight ulceration of cartilage of cup. Left, one quarter of articular surfaces denuded completely of cartilage.

Case.	Sex.	Age.	Condition of Metatarso-phalangeal joint of great toe.
7.	Female .	64	Right, healthy. Left, small but deep denudation of cartilages of cup.
8.	Male . .	33	Right, faint ulceration of cartilage of cup. Left, healthy.
9.	Male . .	46	Right, some ulceration of cartilage of cup. Left, ulceration more marked.
10.	Male . .	48	Right, healthy. Left, healthy.
11.	Male . .	29	Right, healthy. Left, healthy.
12.	Male . .	54	Right, cup and head ulcerated to the same extent. Left, the same.
13.	Male . .	38	Right, healthy. Left, healthy.
14.	Male . .	42	Right, small spot of ulceration at outer edge of cup. Left, commencing ulceration.
15.	Male . .	52	Right, oval ulceration in cartilage of cup, and small ulceration of head of bone opposite that in cup. Left, slight ulceration in cup.
16.	Male . .	34	Right, very faint ulceration of cartilage of cup. Left, slight ulceration of cartilage of cup.
17.	Male . .	47	Right, extensive and well marked ulceration of cup. Left, slight ulceration of cartilage of cup.
18.	Male . .	31	Right, very faint ulceration of cartilage of cup. Left, slight ulceration in cartilage.
19.	Male . .	26	Right, healthy. Left, healthy.
20.	Male . .	34	Right, healthy. Left, healthy.

Lastly, we know that certain poisons are, as it were, attracted to particular parts, and the external phenomena displayed by their action are usually symmetrical. This is exemplified in many cutaneous affections. The same power of selection is shown in the action of many drugs; thus digitalis acts on the heart, opium on the cerebrum, and strychnia on the spinal cord.

With regard to the second question, why numerous joints are implicated in advanced gout, the following appears to be the probable explanation. When the disease becomes engrafted into the system, the amount of urate of soda in the blood is augmented, and requires more surfaces upon which to deposit itself, and hence other joints in addition to the great toe are selected; moreover, the cartilages and ligaments of the joints first attacked after a time become completely incrusted, so much so indeed that the ball of the great toe is in many cases anchylosed, and converted into a solid case of urate of soda, and no further deposit can take place in it.

It is interesting to observe the regularity with which, under ordinary circumstances, the joints are implicated. First the great toes, then the heels, and ankles, afterwards the knees, the smaller articulations of the hands, the elbows, and lastly the shoulders and hips. There are it is true many exceptions to such a sequence, but these can usually be accounted for by the occurrence of blows, sprains, or other injuries. It will be observed that this order has a close relation to the conditions which favour the deposition of the urate of soda; for example, the heels and ankles are much exposed to pressure, and are also remote from the heart; the knees are likewise under somewhat similar circumstances; the hips and shoulders, the least frequently affected, are the joints in which the circulation is most active, as they are near the large arterial trunks and the obstacles to the return of venous blood from them are slight; they are also protected by thick coverings of muscular tissue.

When deposits are formed in the more external parts of the body, those are commonly selected in which the circulation is sluggish; thus we have found the helix of the ear to be a favourite point, and probably this organ is colder than any other portion of the frame. I have before mentioned that in my experience, when patients have had chalk-stones about the joints and not in the ears, these latter were warmer than usual: I only remember to have seen them twice in the ears of women. May not this arise from their being generally kept warm by some covering?

It is not difficult to explain the sudden shifting of gout from one joint to another, if we bear in mind the fact that deposition *precedes* inflammation. Let us suppose that deposition has taken place simultaneously in each great toe, the patient probably feels at first a little pain in both toes, and is doubtful which will prove the worse, when suddenly the one becomes intensely inflamed and the other gets rapidly well. The explanation is simple, as development of inflammation in one part, acting on the principle of derivation, relieves the other, but only for a time, for as soon as the first joint has become better, the other almost invariably takes on action. In advanced gout it is very common for deposition to take place in numerous parts at the same time, and this is the reason why one joint after another becomes inflamed when the patient in other respects is daily improving; for it seems essential that inflammation should ensue before any part in which urate of soda has been infiltrated is capable of remaining in a quiescent state.

The next question which naturally arises in the course of our inquiry is, Why do deposits of urate of soda so constantly take place in ligaments and cartilages, or other closely allied tissues? One reason may be that these structures possess but little vascularity, and the deposit is at once placed beyond the further influence of the blood-vessels, but, in addition to this, it is probable that the fluids of these tissues are less alkaline than those of many others, and certainly less alkaline than the blood itself. Sometimes, in old gouty cases, only a few hours after death, the reaction of the synovial fluid in the joints becomes distinctly acid, but that this is not constant, will be seen in the accounts of several of the dissections in Chapter VI. These two circumstances, the slight vascularity of the tissues and the diminished alkalinity of the fluids, probably explain why such parts are more frequently attacked than others.

Why are females comparatively exempt from gout, at least in its more regular manifestations, and why does the disease so seldom attack young people? These questions can be readily answered. Women, although liable to the influence of hereditary predisposition, are to a great extent free from the action of many of those extraneous causes which both induce and excite gout, more especially excesses in wine and malt liquors; in addition to which they partly owe their immunity to the occurrence of the catamenial discharge during many years of adult life, which constantly tends to rid the system of superfluous blood without engendering debility. It is after the cessation of this function, or when it has become arrested by accidental causes, that gout is most apt to develop itself, and the aphorism of Hippocrates already referred to is practically correct. During youth, when the growth of the body is rapidly advancing, and excess of nourishment is required to build up the frame, and while the secreting functions are in full activity, there is little tendency to engender such a state of blood as would lead to the development of gout, and youth moreover is often exempt from many of the predisposing causes of gout.

It would thus appear that hereditary tendency alone is often inadequate to cause the full development of gout, and there are many examples on record of men who, though strongly inheriting the disorder, yet pass through life without a single attack; but in them, as well as in women, it is common to find strong evidence of their constitutional tendency in the manifestation of many symptoms of the masked forms of the disease; the same is occasionally witnessed in young people.

Lastly, it may be asked, Why does gout almost invariably recur, and why does it in the earlier attacks exhibit signs of periodicity in its return?

These phenomena are explained by the fact that in gouty subjects an impure state of the blood is generally present, arising either from an increased formation of uric acid in the system, or from its defective elimination; when, therefore, any exciting cause is more than usually active, a fit is at once induced; in the early stages this usually happens in spring or in autumn, when the circulating and secreting organs are peculiarly prone to sudden derangements, but after a time the seizures become more frequent, and are brought on by the operation of the slightest irregularities, because the causes both of the increased formation and of the defective elimination of uric acid are generally not only unremoved but even increased. Now and then only a single fit occurs during life, but such cases are quite exceptional. In individuals not hereditarily predisposed to gout, great care in diet and regimen and a completely altered course of life, will sometimes prevent a further recurrence, even after several attacks have been experienced.

CHAPTER X.

TREATMENT OF GOUT:—SHORT REVIEW OF THE TREATMENT ADOPTED BY THE ANCIENTS—IS GOUT A CURABLE DISEASE?—CULLEN'S OPINION—AUTHOR'S VIEWS ON THE VALUE OF REMEDIES IN THE DIFFERENT STAGES OF GOUT—TREATMENT OF ACUTE GOUT—DIET AND REGIMEN—THE VALUE OF PURGATIVES—MERCURIALS—THEIR INJURIOUS EFFECTS IN MANY CASES—DIURETICS AND DIAPHORETICS—BLOOD-LETTING—COLCHICUM—LOCAL TREATMENT—LEECHES—BLISTERS—WARM APPLICATIONS—EVAPORATING LOTIONS—ANODYNES—SUMMARY OF THE TREATMENT OF THE GOUTY PAROXYSM.

THE general plan of treating gout adopted by the ancients has been already sufficiently indicated in our introductory chapter, from which it may be gathered that physicians of olden times had recourse to free depletion by bleeding, purgatives, and emetics, and often combined with these the employment of the hermodactylus; at the same time they enforced abstinence in diet, especially at the commencement of the paroxysm. They also had recourse to local appliances, as scarifications, fomentations, and emollient ointments. During recovery a more generous diet and stomachics were allowed, and friction of the affected joints was frequently enjoined.

These remedial methods were doubtless founded on their ideas of the nature of the disease and the best means of getting rid of the offending matter from the system; but the heroic plans adopted, even if available then, would certainly ill-suit the present generation; and it must now be our endeavour to point out the means most likely to conduce to the alleviation and cure of gout as it exists at the present time.

Whether it is possible to cure gout is an inquiry not unfrequently made, and the conclusion generally arrived at is by no means satisfactory either to patient or physician. An opinion has long prevailed, not only among the public but likewise in the profession, that gout is altogether an incurable malady; that gout alone is the cure of gout, or in other words, that a fit of the disorder is essential to rid the system of the impurities which have led to its production. Such an idea probably arose from the remarks contained in the writings of some physicians upon this subject; for example, in the works of Sydenham, we find the following passage; "In gout, it seems as if it were the prerogative of Nature to exterminate the peccant matter after her own fashion, to deposit it in the joints, and afterwards to void it by insensible perspiration;" and Cullen, looking upon gout as a disorder of the whole habit, and depending on original conformation, considers it probable that it could not be cured by medicines, the effects of which are always transitory, and seldom extend to the production of any material change in the economy. Cullen also considers that it would perhaps have been fortunate for gouty persons had this opinion been implicitly received by them, as it would have prevented their becoming so often the dupes of quacks, who either trifled with inert medicines or rashly employed those of a pernicious tendency.

Although individuals, originally possessed of strong constitutions, now and then experience periodic attacks of gout, sometimes even for half a century, without appearing to be materially injured by them; yet such cases form the exception to the rule, which is for the disease to become more chronic; for depositions to take place in and around the joints, thus producing stiffness and deformity; and for the eliminating power of the kidneys to become gradually less and less efficient. It is quite true that a patient often feels much relieved by a fit of gout, for the system by this means has rid itself of much which was previously causing distressing symptoms; and this fact gave rise to the opinion of Sydenham, that the more violent the inflammation the shorter the paroxysm, and the longer the interval between it and the next.

We have already seen that gouty attacks, although they may be in a certain degree regarded as curative, are likewise injurious, and that deposition invariably occurs in the affected joints, which henceforth acts as foreign matter and frequently causes further mischief.

Having fully established this view of the pathology of the disease, it is only reasonable that our endeavours should be directed, first to preventing the formation of gouty matter, and next to aiding its expulsion from the system by other channels than the articular surfaces of the joints; and that we should not content ourselves simply with encouraging a fit, as has been often advised.

My own opinion as to the value of treatment in gout, derived from an extensive experience, is that,—

First. In its acute form, gout is as controllable, and as much under the influence of remedies as any other inflammatory affection. At the same time I wish to lay great stress upon the nature of the treatment, feeling fully convinced that not only the duration of the paroxysm, but likewise the injury inflicted upon the joints, can be reduced by the judicious use both of medicines and hygienic remedies.

Secondly. The more chronic forms of gout, met with in every degree of severity, are also fully under the control of the physician; if not for their radical cure (and this can scarcely be looked for when crippling of the joints and extensive deposits have already occurred), yet for so much relief as will enable the patient to enjoy life; besides which, appropriate treatment will in most cases prevent a further mischief, which is so prone to ensue, if the disease be allowed to run its own course, or, still worse, if it be recklessly tampered with.

Thirdly. As gout is a disease which is not only apt to return with increased severity, but to acquire a firmer hold on the constitution at each visitation, it is a matter of serious moment to consider whether it may not be prudent in the intervals of the attacks, not only to regulate the diet and regimen, but even occasionally to have recourse to some means, scarcely to be called medicinal, by which the blood may be kept free from those impurities, which by their accumulation lead to the production of the paroxysm.

The treatment of gout founded on Cullen's aphorism of trusting to patience and flannel is to be highly deprecated. It may indeed be argued that it is the natural treatment and that Nature is a sure guide; but it must be remembered that man in a civilised state is not in a normal condition of life; were he so, in all probability he would never acquire gout; and that when suffering from a disorder so acquired, he must be content to have recourse to artificial remedies. If he could entirely lay aside his usual habits, and follow in all respects the dictates of nature, there would probably be little need to seek relief from medicine.

I shall endeavour to point out the treatment best suited for the majority of patients in the different stages of gout; but all who have had experience in clinical medicine must be fully aware, that each individual case not only exhibits its own peculiarities and becomes a separate study, but likewise demands, in certain respects, a special treatment. The neglect of this consideration, which is apt to lead to a routine practice closely bordering on empiricism, has thrown no little obloquy on the science of therapeutics.

Treatment of Acute Gout.—When called to a patient suffering from an early and acute fit of gout, we should usually follow the rules which apply to the treatment of ordinary inflammation of equal intensity, always bearing in mind that we are dealing with a disease originating in a peculiar condition of the system, which is capable of considerably modifying the various symptoms that may present themselves. Except under peculiar circumstances, a strict antiphlogistic diet should be enforced, but as the appetite is sometimes keen, this cannot on all occasions be easily accomplished. Experience convinces me that in many instances a fit of gout is prolonged to an unnecessary degree from sufficient regard not being paid to this point, and many patients have informed me that, whereas under a regimen in which animal food was allowed, they were accustomed to suffer many weeks from each paroxysm, under a properly restricted diet, their attacks have passed off in an equal number of days. The error of allowing animal food in such cases has arisen not only from a wish to gratify the patient's appetite, but from a very prevalent idea that a nutritious diet is necessary to guard against the occurrence of debility. On consideration, however, it must be evident that the lowering of the system induced by a longer continuance of inflammation far exceeds any trivial debility which can possibly be caused by the necessary abstinence; moreover, although appetite be present, the digestive powers are weak, and animal food taken at such times aids greatly in augmenting the impurity of the blood, and increasing the gouty condition.

The rules of diet in cases of acute sthenic gout may be thus shortly summed up. The patient should be confined to a diet consisting of little more than diluents and farinaceous food, until the disease has shown a decided inclination to abate, which is indicated by diminished tension of the skin of the inflamed part, mitigation of the pain, and the ready production of pitting. Such a diet would include bread, arrowroot, sago, tapioca, and the like, with milk, thin gruel, barley, or toast and water, and weak tea. The free drinking of diluents is of advantage, as it keeps up the action of the skin and kidneys, but stimulating or alcoholic beverages should in most cases be strictly forbidden, or the fit may be greatly prolonged; as an instance I may mention that a lady once informed me that she had once suffered as long as six months from an attack, and the only cause to which such a lengthened duration could be attributed was her having taken two or three glasses of port wine every day, in order to combat a feeling of great prostration.

Now and then, it is true, circumstances arise which render it advisable to relax somewhat, but I am convinced that in acute gout their occurrence is rare, and we should not too readily be led to deviate from the prescribed plan from the mere sensations of the patient, but be guided by the state of the pulse and other objective rather than subjective symptoms. When the febrile disturbance has abated and the local affection has become relieved, a return to a more nutritious diet may be allowed, taking care that nothing be given likely to cause indigestion; such as beef-tea at first, and then white fish, afterwards fowl or tender meat, but this latter in moderation, for we must remember that everything beyond what is absolutely required for the nourishment of the body only feeds the disease. Even at this stage it is usually imprudent to have recourse to alcoholic stimulants, but if really necessary to promote digestion, a very small quantity of brandy may be given, freely diluted either with plain or aërated water; hollands or whiskey, if preferred, may be substituted for brandy. If wine be taken, a little hock or claret is most suitable, but we must remember that wines of all kinds possess a much greater power both of inducing and exciting gout than distilled spirits. Malt liquors should be altogether prohibited, as especially prone to cause a recurrence of the paroxysm.

When febrile disturbance is present to any extent in acute gout, the patient should keep his bed at least for a few days, as too early exposure or exertion sometimes causes the inflammation to leave the joints and implicate more important organs, and instances of this kind in which the brain has thus become affected and delirium has followed are not uncommon. On the other hand, too much warmth and inactivity are decidedly injurious, as they induce debility, and prevent the due action of the various organs. In former times many advocates were found for attempting to drive off the paroxysm by extreme exertion; this may perhaps be sometimes successful when a mere threatening exists, but not when inflammation has become established. On the subsidence of the fit, moderate and gradually increased exertion is of much service, and likely to prevent the injured joint from remaining stiff and weak. Some cases are on record in which an attack of gout has been cured or arrested by taking long walks. Sir William Temple relates the case of a Rhinegrave and of a Nassau prince being thus treated with success; these instances, however, may be looked upon as very exceptional.

The medicinal treatment of gout may be divided into the constitutional and the local treatment.

The constitutional treatment should be directed to the diminution of inflammation and febrile disturbance, and the restoration of the blood to a healthy condition. To effect the first of these objects the medicines employed to subdue ordinary inflammation may be resorted to, the secretions from the bowels should be kept up by purgatives; the action of the kidneys and skin by saline diuretics and diaphoretics; the force and frequency of the pulse may sometimes be moderated by vascular sedatives; and the pain, if necessary, alleviated by the use of anodynes. The restoration of the blood to its healthy state is best effected by giving remedies which have a special influence upon the composition of the circulating fluid.

We will now endeavour to point out the value of the several remedies which have been thus employed not only in the paroxysm, but also in gouty conditions of the habit.

Purgatives.—Some physicians have altogether condemned the use of purgatives in gout, others have been loud in their praise. Among the former may be mentioned Sydenham, Mead, and Boerhaave; among the latter, Hoffman, Sutton, and Scudamore. Sydenham carried his idea of the danger of purgatives in gout to an extreme length, as will be seen in the following passage from his Treatise. "Sure I am that all purging, mild or sharp, intended to relieve the joints, is injurious, whether it be during a fit to diminish the peccant matter, at the end of one to dissipate the remnants of the disease, or during an intermission to guard against the occurrence of one. From myself and others I have learnt that purges bring on what they were meant to keep off." He then goes on to explain how purgatives act injuriously under these different circumstances, and how in his own person they had completely failed to accomplish the desired object, and he asserts that he has known persons persevere in this method most rigorously, and yet continue to suffer from gout in its most aggravated forms. Scudamore, on the other hand, acting upon the indications suggested by his own view of the nature of gout, and considering that it was closely connected with portal congestion, gave purgatives very freely, and more especially those which are supposed to produce a cholagogue effect. He commonly employed a combination of calomel, antimonial powder, and compound extract of colocynth, repeating it nightly or every second night, according to the character of the evacuations and the advantages which appeared to be derived from the treatment; along with these he was in the habit of ordering a draught containing magnesia, sulphate of magnesia, and the extract of colchicum.

In speaking of the value of purgative medicines, I purposely exclude colchicum, not that it is wanting in cathartic action, but because it certainly does not owe its efficacy to this property, and frequently proves of most benefit when its operation is unattended with increased alvine evacuation. My own experience has taught me that in the acute stages of the disease, purgatives possess no peculiar power of lessening the articular inflammation, and can therefore in no way be depended upon for effecting this object. I am induced to make this remark, being aware that some practitioners look upon the curative action of colchicum as due to its cathartic properties, and have an idea that a like amount of purgation excited by other remedies would answer the same purpose. Of the incorrectness of this opinion I am fully convinced from repeated clinical observations, and from the results of trials made to determine this point, which will be related when we discuss the therapeutic powers of colchicum.

Purgatives given in moderation are undoubtedly of value in many cases of acute gout, more especially, when accompanied with constipated bowels, retention of the bile, and portal congestion; but their efficacy under such circumstances simply depends on their power of restoring to a healthy state functions previously deranged, and not on their producing any specific effect either upon the affection of the joints or the state of the blood. It is very questionable if the secretion from the mucous membrane of the bowels induced by the operation, even of hydragogue purgatives, contains uric acid at all, but certainly it does not hold sufficient sensibly to relieve the impure state of the blood: in gout we can neither reasonably hope for, nor do we find, from the action of hydragogues, the relief which so frequently follows their administration in cases of albuminuria, or in anasarca dependent on cardiac disease. On the other hand, purgatives if given in doses sufficient to cause depression are decidedly injurious, for although some temporary mitigation of suffering may be afforded, yet the disease is rendered more liable to recur and to assume a chronic and asthenic form. The amount of cathartism must be determined by the peculiarities of the individual case, for that which in one would not be followed by appreciable inconvenience, in another may be attended with serious prostration.

The kind of purgatives most suitable to the treatment of gouty inflammation must depend on individual peculiarities; if mere constipation exists without sensible derangement of the hepatic function, the simple laxatives or milder cathartics may be employed, such as manna, magnesia, rhubarb, senna, or aloes, or compounds of these, as Gregory's powder, the compound rhubarb pill, compound colocynth pill, and the ordinary black draught; sufficient only being prescribed to insure the absence of an undue amount of excrementitial matter in the alimentary canal. If, however, the liver be in fault, other purgatives may be advantageously employed, and those should be selected which are known to possess an influence over the secretion of this organ. Small doses of a mercurial preparation, as calomel or blue pill, combined or not with colocynth, may be given at night, and followed in the morning by the ordinary black draught. In some patients the addition of a little extract of colchicum to the colocynth pill will answer the purpose of the mercurial; in others the combination of the mercurial and colchicum is attended with beneficial results. In some cases small doses of Podophylline may be advantageously prescribed, mixed with colocynth extract or some other purgative.

Saline purgatives are fitted for strong and plethoric habits, and the sulphate of magnesia, tartrate of potash, and similar salts, may now and then be given with advantage, combined or not with senna, rhubarb, or jalap and some aromatic; at the same time powerful hydragogue action should be avoided. Many patients derive great advantage from taking each morning either the Friedrichshall or Püllna bitter waters or the Carlsbad salts; the former may be taken mixed with about twice their amount of boiling water; the latter in so much hot water as to cause the solution to be very dilute.

It is scarcely necessary to allude to the use of *Emetics* in the treatment of gout, as they are only called for in exceptional cases. If, at the commencement of a fit, the stomach be greatly loaded and oppressed, emetics may afford relief, but they do not seem to exert any special influence on the progress of the attack. The use of these remedies in the treatment of gout has been advocated by some physicians, and Dr. Small was accustomed to employ them in his own case, taking tartar emetic combined with cinchona bark.

Mercurials.—The use of mercury as a purgative has been already mentioned as occasionally of advantage in the treatment of acute gout; but I must here impress on the reader the great importance of caution in its administration, especially in the case of gouty subjects in whom there is reason to suspect any disease of the kidneys. In these cases mercurials, if given beyond the amount sufficient to act as hepatic alterants, may be productive of most injurious consequences, and I have witnessed profuse salivation brought on by the administration of only two grains of calomel. Scudamore, who used mercury rather freely as an alterative, and considered that, if employed with judgment and caution, it was a most valuable agent, appeared to be impressed with the fact that, when given in repeated doses, it was liable to be followed by serious evil in gouty subjects, and in support of this opinion relates several illustrative cases. As it can be shown that mercury has no specific power in controlling gouty inflammation, it follows that, except with a view to its immediate cholagogue effect, it should not be administered. In advanced forms of gout it should be altogether avoided.

Diuretics and Diaphoretics.—These remedies are often of much service in acute gout when the urine is deficient in quantity, and the skin hot and dry. The action of the kidneys can usually be promoted by the use of such saline remedies as the acetate, citrate, tartrate, nitrate, or bicarbonate of potash, or by the phosphate of soda or sulphate of magnesia given in quantities insufficient to produce a purgative action. Most of these salts possess the power of altering the condition of the blood by rendering it more alkaline, and thus prove of considerable service in acute gout; on this point, however, we shall have occasion to dwell more fully when speaking of the treatment of the chronic affection. When it is desirable to induce diaphoresis, the acetate of ammonia may be given, care being taken to aid its action by the free use of diluents. Occasionally it may be advisable to promote the action of the skin by the hot air or vapour bath, or by tepid sponging with water or vinegar and water, but great caution must be used to avoid a chill to the surface of the body.

An agreeable and effectual method of stimulating the skin and kidneys and at the same time producing an alterative action on the blood, is to give a mixture of carbonate of ammonia and bicarbonate of potash with citric acid; ten grains of each of the carbonates and fifteen grains of the acid, form, when properly diluted, a pleasant draught, especially when taken in an effervescing state; a tablespoonful of fresh lemon juice may be substituted for the citric acid.

Anodynes and Narcotics.—As an acute gouty fit is often accompanied with intense pain, the question of the propriety of giving direct anodynes is one of some importance. That opium often speedily relieves the pain of gout there cannot be a doubt, but is its action followed by injurious consequences? Cullen thus answers the question: "Opiates give the most certain relief from pain, yet when given in the beginning of a gouty paroxysm, they cause it to return with greater violence." Sydenham also was averse to their employment except under special circumstances. My own experience has led me to form a very similar opinion, and in the majority of gouty cases, unless the pain be very excessive, or there be fear that if not relieved the patient's nervous system will suffer, I always feel disposed to withhold their administration, and trust to other means, as opiates tend so powerfully to diminish the secretions and to augment congestion of the portal system.

It sometimes happens that opium is really required, and when such is the case, the drug itself or the tincture, or some salt of morphia may be administered. It is desirable to combine opiates with a sudorific and purgative, to avoid as much as possible their baneful influence upon the secreting organs. The compound powder of ipecacuanha is a useful form.

With regard to other anodynes, as henbane and belladonna, circumstances may occasionally arise demanding their use, but these depend more upon the idiosyncrasies of the patients than the form of the disease. Henbane, for example, often produces a soothing effect in individuals in whom opiates cause nervous disturbance, and both henbane and belladonna possess the advantage of not diminishing the secretions. Aconite has been recommended by some, but its value in gout is by no means established; it is certainly far inferior to colchicum in its power of controlling gouty inflammation, though perhaps it may be more potent than that remedy in acute rheumatism.

Blood-Letting.—In the treatment of an attack of acute gout the question of the value of blood-letting naturally arises, and although its discussion would have had more importance in former days, before the lancet had fallen so much into disuse, it still affords enough interest to allow us to devote a few lines to its consideration.

Sydenham, although he thought bleeding by no means a remedy capable of curing gout, yet under certain limitations sanctioned its employment, as will be seen from the following passage: "Nevertheless, if the patient be young, and have drunk hard, blood may be drawn at the beginning of the fit. If, however, it be continued during the following fits, gout will take up its quarters even in a young subject, and its empire will be no government, but a tyranny." Cullen also, no advocate for much interference in gout, thinks some means may be taken with advantage to moderate the inflammation, especially in the young and vigorous, and in early paroxysms, and that bleeding may then be useful, but he is persuaded that it cannot be repeated with safety. From the qualified tone in which the opinions of these eminent men were announced, it is evident that although they occasionally allowed, they did not put much faith in this remedy, and notwithstanding that the advantages of general blood-letting were strongly insisted on by Drs. Hamilton, Rush, and Huxham, the profession, at the present day, seems to be tolerably unanimous in considering it a form of treatment which should only be resorted to in exceptional cases.

Dr. Todd considers that blood-letting, by inducing asthenia, causes the inflammation to shift from place to place, but on the contrary, Dr. Gairdner was of opinion that in several cases of gout he had obtained much advantage from the use of small bleedings, as will be seen from the annexed quotations: "There are cases of plethora and atonic gout which, but for this remedy, would have baffled me, and yet were speedily and very thoroughly relieved by its aid;" and, "It is with me no matter of doubt, but of absolute certainty, that in instances of this kind much suffering may be saved and no injury done by the practice I have recommended;" but it is right to quote another passage in which he says, "It is necessary I should state that I never make use of this remedy in, and I consider it wholly inapplicable to cases of gout in an impaired or defective constitution, even though there be evidence of plethora in the system. I believe that some considerable energy is necessary to its legitimate use, but this is generally met with in the early stages of gout."

Bleeding is certainly not curative of gouty inflammation, and, therefore, cannot be looked upon as a remedy having any specific power in its treatment. It can neither diminish the impurity of the blood, nor remove the deposit which has taken place in the inflamed structures; the only advantage which can possibly be derived from its use is the relief of plethora, which is usually present in the febrile attack; but this can generally be more safely effected by other and milder means. I have occasionally met with patients with acute gout who have apparently experienced distinct relief from small venesections, but I have in no instance abstracted more than five or six ounces of blood, frequently less, and never sufficient to cause the slightest permanent debility. From my own experience I am convinced that whenever blood letting has been carried to such an extent as to cause subsequent depression,—and I have seen several cases where this has been so,—its effect has been to render the attacks more frequent and prolonged, without any advantage in the mitigation of the paroxysm.

The following rules as to the use of bleeding in gouty cases may be safely relied upon :—

Never bleed with the idea of directly subduing gouty inflammation.

Never bleed in advanced gout, or when the constitution is much weakened.

If bleeding be required in order to relieve general or local plethora,—and the former, at least, scarcely ever occurs in large cities,—abstract only so much as is sufficient to effect that object, remembering that further depletion tends greatly to aggravate the disease and prolong its duration.

Local Treatment of Acute Gout.—Should we leave the inflamed joints to themselves, or should we have recourse to local treatment? It is of some practical importance to decide this question correctly, for patients, naturally anxious for a speedy relief to their sufferings, are prone to think that remedies applied immediately to the painful part are likely to effect the desired object; the physician, on the other hand, may regard constitutional treatment as most efficacious, and look upon local applications as not altogether unattended with danger. It will, therefore, be desirable to pass in review some of the principal local remedies which have been proposed to alleviate gouty inflammation, and endeavour to ascertain their real value.

Leeches.—Our knowledge of the pathology of common inflammation and of the marked benefit derived from local depletion, would lead us to suppose that the condition of a joint in acute gout would be immediately relieved by leeches, and hence it is not very unusual to find that recourse is had to them under such circumstances. But experience does not sanction their employment, as it has been sometimes followed by a transference of the inflammation either to some other joint previously free, or to one of the internal organs, and sometimes by the occurrence of a diffuse form of inflammation. It has been also thought by some physicians that, although leeches may occasionally give temporary ease, the recovery is thereby prolonged, and permanent weakness of the joint induced.

If we direct our attention beyond the mere appearance of the joint, and reflect upon the intimate nature of gout, and moreover, if we view the inflammation merely as the local manifestation of a morbid condition of the whole system, we shall at once find an explanation of the comparative inefficiency of local depletion.

My own opinion of the inutility of local depletion in acute gout is so very decided, that I never order leeches to an inflamed gouty joint, considering that the application is never likely to prove efficacious, and that it may be attended with injurious consequences.

I have met with several cases illustrating the great injury which may arise from the use of leeches over joints acutely affected with gout. In two cases, one of a colonel, and the other of an army surgeon, I have seen both knee joints perfectly anchylosed by their free application; and in several instances the metatarso-phalangeal joint of the great toe has been completely stiffened by the same treatment.

It is difficult to understand why local depletion of an inflamed joint leads to such mischief, but that it does so I have no doubt in my own mind; may it not be that the weakening of the blood vessels of the part by blood-letting favours the free deposition of urate of soda in the tissues of the joint?

Blisters.—The use of blistering as a local remedy in gout is by no means new; about a century ago, a woman at Horsham was accustomed to sell a plaster which gained much reputation, and which, after the purchase of the secret, was discovered to consist simply of the ordinary blistering cerate. In 1770, Dr. Cartwright tried blisters with complete relief to pain; and Sir B. Shelley is said to have used them for nearly sixty years, when suffering from attacks of this disorder. Within the last thirty years, Dr. Todd advocated the same local treatment of gouty inflammation.

From having employed small blisters in many cases of gout I have formed the following conclusions as to their value, and the circumstances under which they are needed.

Blisters are unnecessary in the early fits of asthenic gout, when the joints are not appreciably injured by prior attacks.

Blisters are contra-indicated in advanced gout, when the excreting power of the kidneys has become impaired; and especially in cases of extreme gouty deposits, as sores may be produced which are difficult to heal.

Blisters are of most advantage in cases of gout of an asthenic character, when the inflammation has a tendency to linger in the articulations and cause effusion.

A rational explanation may be given of the value of blisters in chronic and asthenic forms of gouty inflammation, as they give a stimulus to the local circulation and the morbid action is directed from the tissues within the joint to the surrounding skin; beside which they cause a certain amount of serous exudation, and thus rid the blood of some of its impurity.

The *moxa* has now and then been advised in gout, and was used by Sir William Temple with considerable relief.

Numerous applications have at various times been suggested by different practitioners, and some of them are deserving of attention.

Warmth and Moisture.—The application of warmth to the inflamed joint has been commonly advised, and this is best effected by enveloping it in new flannel or carded cotton surrounded by oiled silk; by these means the joint is kept not only warm but also moist; in fact, in a kind of vapour bath; heat alone, without moisture, often serves to aggravate the pain. When cotton wool and oil silk are used, it will be found that the wool, after a short time, becomes very wet, and usually requires to be changed at least twice in the twenty-four hours; hot fomentations and poultices are also occasionally employed with advantage. Some have objected to the application of warmth in any form, under the idea that it causes too much relaxation and subsequent weakness, but it is very doubtful whether the objection to the use of carded cotton is valid, provided that it is only kept on during the time the inflammation is severe.

Scudamore strongly advocated the use of tepid evaporating lotions round the inflamed joints, and employed a mixture of one part of rectified spirit and two parts of camphor water. He states that he had used this lotion lukewarm, applying it on linen rags, and had found it to be very successful; he recommends a temperature of 75° to 85° Fahr.

Anodynes.—Now and then, when the pain is very intense, relief is given by anodynes, and preparations of opium, belladonna, aconite, and hydrocyanic acid have been used for the purpose. Those of belladonna are perhaps of most service, and an elegant method of applying the drug is in the form of a solution of atropine, made by dissolving from two to three grains of the alkaloid in a fluid ounce of spirit and water, and applying it to the inflamed joint by means of compresses of lint or a few folds of linen, preventing evaporation by a covering of oiled silk.

Another application I am frequently in the habit of using consists of the liniment of belladonna with hydrochlorate of morphia dissolved in it, in the proportion of one grain to the fluid drachm; this may be diluted with about five parts of hot water, and applied as above, or equal parts of the belladonna liniment and tincture of opium may be diluted with water and used in the same way. Many patients have expressed themselves as finding very great benefit from such applications.

Cold.—Occasionally physicians, regarding gout as only a local affection, have had recourse to the application of cold to the inflamed joint, and sometimes patients, with an idea of obtaining rapid relief from their sufferings, have immersed the inflamed limb in cold water, or even applied snow directly to the part.

This plan of treatment is fraught with the greatest danger, and cannot possibly be advocated on any rational view of the nature of the disease, as it is apt to cause retrocession of the articular inflammation, and the sudden and serious affection of some internal organ; at no time does it more than temporarily assuage the pain, and never exerts any lasting influence over the severity or duration of the paroxysm.

The management required in an ordinary attack of acute gout may be thus shortly summed up:

The diet should be very light and chiefly amylaceous, diluents freely used, and but little alcoholic stimulant allowed, unless in exceptional cases.

The medicinal treatment should consist of the administration of some simple alkaline saline, combined with a very moderate dose of colchicum. If necessary, purgatives may be given, selected according to the habit and condition of the patient. In the majority of cases this will be found to be all that is necessary, but in some instances certain modifications may be essential; for example, if there be plethora, the question of the abstraction of a few ounces of blood may possibly arise: on the other hand, if the vital powers are at a low ebb, and great vascular and nervous depression exists, it may be desirable to give ammonia in addition to other salines; at the same time the colchicum should be either omitted or used with the greatest caution.

The only local application required in the majority of cases is cotton wool, covered lightly with oiled silk, but now and then an anodyne may be advantageously used, and a small blister is occasionally of service.

CHAPTER XI.

TREATMENT OF GOUT :—COLCHICUM—IMPORTANCE OF THE STUDY OF ITS MODE OF OPERATION—THE HERMODACTYLUS OF THE ANCIENTS PROBABLY A SPECIES OF COLCHICUM—CHEMICAL COMPOSITION OF COLCHICUM—ITS PHYSIOLOGICAL ACTION—CURATIVE EFFECTS NOT EXPLICABLE BY ITS PURGATIVE PROPERTY—ITS INFLUENCE ON THE CIRCULATING SYSTEM—ON THE URINE—SIR R. CHRISTISON'S EXPERIMENTS—OBSERVATIONS OF PROFESSOR CHELIUS—AUTHOR'S ANALYSES EXHIBITING THE EFFECT OF COLCHICUM ON THE URINE—DEDUCTIONS THEREFROM—MODE OF EMPLOYING COLCHICUM IN THE TREATMENT OF GOUT—THE QUESTION DISCUSSED AS TO ITS LIABILITY TO CAUSE MISCHIEF—DIFFERENT PREPARATIONS OF COLCHICUM—WHITE HELLEBORE IN GOUT—GREEN HELLEBORE—LAVILLE'S TINCTURE.

As Colchicum is a drug extensively employed in the treatment of gout, and, though condemned by some, regarded by others as a specific, it will not be out of place to devote a short Chapter to its consideration, and to the endeavour to ascertain the manner in which its influence upon the system, for good or evil, is exerted.

Among the later Greek and Arabian physicians, a medicine called hermodactyl (ἑρμοδάκτυλος, from Ἑρμῆς Hermes or Mercury, and δάκτυλος a finger) was in great repute as a remedy for arthritic diseases, being first mentioned by Alexander of Tralles, about the year A.D. 580. Paulus Ægineta, Avicenna, Serapion and Mesue, likewise allude to it.

Under the name of Surugen or hermodactyl, Serapion comprehends the κολχικόν and ἐφήμερον of Dioscorides, and the ἑρμοδάκτυλος of Paulus, and by some of the older writers the hermodactyl was called anima articulorum, or the soul of the joints. Dr. Pereira considered that the drug brought in modern times from Oriental countries, under the name of hermodactyl, answers to the recorded description of the ancient substance bearing the same name, and he was therefore induced to believe that they were identical, and consisted of the underground stems or corms of some species of colchicum, but not of colchicum autumnale. The hermodactyls have not been submitted to the test of physiological experiment in this country, though, from the description of those employed in the treatment of joint affections by Paulus Ægineta, it seems that they resembled in their action our ordinary colchicum, for he says, "Some, in the paroxysms of all arthritic disease, have recourse to purging with hermodactylus; but it is to be remarked that the hermodactylus is bad for the stomach, producing nausea and anorexia, and ought therefore to be used only in the case of those who are pressed by urgent business; for it removes rheumatism quickly and after two days at most, so that they are enabled to resume their accustomed employment."

The Colchicum Autumnale, or Meadow Saffron, has only been employed within the last century, having been introduced as a medicine by Baron Störk, in 1763; it is probably the active ingredient of the celebrated Eau Médicinale, which was once employed about that time by M. Husson, a military officer in the service of the King of France.

Colchicum Autumnale belongs to the natural order Melanthaceæ, in which it is associated with several other plants possessing powerful effects on the animal economy, as, for example the Veratrum album or white hellebore, the Veratrum viride, and the Assagræa officinalis or cevadilla. The corms and seeds are the parts mostly employed in medicine, but the flowers have been occasionally used; when chemically examined, all parts of the plant are found to possess a bitter and somewhat acrid taste, evidently depending on the presence of a peculiar principle.

At first, on the authority of Pelletier and Caventou, the bitter and active matter of colchicum was supposed to be the same as that which exists in the veratrum album and cevadilla; this, however, is erroneous. Geiger and Hesse subsequently asserted that they had obtained an alkaloid from the colchicum plant, which they named Colchicia, differing from veratrine in many properties, being crystalline, soluble in water, alcohol, and ether, bitter in taste, but devoid of the irritating or sternutatory effects possessed by veratrine, and giving with nitric acid a beautiful violet colour, quickly changing first to indigo, then to green and yellow. Many chemists have endeavoured to obtain crystallised colchicia, since the announcement of Geiger and Hesse, but I believe without success. In 1856, M. Oberlin re-examined the subject, and the following are the results of his investigation: He was quite unable to obtain the alkaloid described by Geiger and Hesse, but separated another substance, which he has named Colchiceine; this principle is almost insoluble in water, but soluble in alcohol, ether, and chloroform, it is neutral in re-action, and gives with nitric acid a beautiful violet colour.

The physiological effects ascribed to colchicum are those of a powerful local irritant and nervine sedative; on the lower animals, such as the dog, it causes, when injected into the veins, loss of all voluntary power, extreme slowness of breathing, and considerable diminution in the rapidity and force of the pulse; vomiting and bilious purging are also produced; the pulse afterwards becomes rapid and irregular, the breathing hurried, and death ensues. After death the mucous membrane of the stomach and duodenum, and other parts of the intestinal canal, are found congested and inflamed. Cases of poisoning from colchicum in the human subject are on record, and the effects most uniformly observed are vomiting, purging, and tenesmus; slow, weak, and often intermitting pulse; coldness of the extremities, and great prostration of strength: convulsions and coma are seldom produced. When administered in therapeutic doses, colchicum is considered to possess a considerable power over the secreting and excreting functions, and especially over those of the intestinal mucous membrane. If the dose be large, and frequently repeated, it purges, and not uncommonly produces nausea and vomiting; its influence upon the liver is readily recognised by the appearance of the fæces and vomited matter; colchicum is generally regarded as possessing a diuretic action, and is also considered to alter the composition of the urine, increasing the amount of the solid portion, and more especially of the uric acid and urea; we shall presently endeavour to show from the results of our own investigations, whether these latter suppositions are correct.

That colchicum in its various forms has a most powerful influence upon the progress of gouty inflammation is undeniable, and this action is not simply limited to the removal of gout when it attacks the joints, but it proves efficacious even in its masked and irregular forms. Sir Henry Holland states that from experience he can assert that the influence of colchicum is striking and well defined in the chronic forms of the constitutional disorder, in the peculiar ophthalmia of gouty habits, in gouty bronchitis, and also in a class of headaches connected with this diathesis. My own experience fully coincides with that of Sir H. Holland, and I would even go the length of asserting that we may sometimes diagnose gouty inflammation from any other form by noting the influence of colchicum upon its progress.

Many physicians consider that it is necessary that colchicum should purge, in order that relief may be obtained from its use; but the opinion of those who have had most experience of the remedy militates against this view, as do likewise my own observations, which prove, in addition, that brisk purging produced by other means is not productive of the same beneficial effect. I have found speedy relief afforded by the use of colchicum, to persons suffering from the most excruciating pain, without the occurrence of any appreciable discharge. One patient whose attacks were very severe, and who had been accustomed for a long time to take the drug without medical advice, stated that in two or three hours after taking a two-drachm dose of colchicum wine, he felt himself in paradise, yet no action of the bowels had been produced. In another instance when I ordered a drachm and a-half of the same preparation, very rapid alleviation of pain was experienced, yet unattended with purging or sensible evacuation; and I have seen many other gouty patients experience similar relief from like doses: in one case only was purging induced, and then not until some hours after the pain had subsided.

To show the inefficiency of simple purging in controlling gouty inflammation, I may mention the case of a man about 32 years of age, who, at the time of admission into the hospital, was suffering from his seventh attack of gout, and had numerous joints affected, with a quick, full, and hard pulse, a furred tongue, great thirst, and hot and dry skin. A draught containing two drachms of sulphate of magnesia and a scruple of the carbonate suspended in an ounce of cinnamon water was administered three times a day; this freely purged the patient, causing yellow watery stools. The gouty affection after two days' treatment was not sensibly relieved, the draught was consequently omitted, and in lieu of it drachm doses of colchicum wine were administered. Two days afterwards, at the visit, he expressed himself much relieved by the fresh medicine, having had no pain during the night; the bowels had only been acted upon once; the joints were much relieved, still somewhat tender, but not painful when at rest; the pulse soft, 72, and there was no feeling of nausea.

The above case plainly shows that colchicum will give ease without inducing purging, and also that other purgative medicines may be freely given without similar relief. I selected the sulphate and carbonate of magnesia, inasmuch as they form the ingredients of a favourite colchicum mixture, and it has been occasionally supposed that the relief afforded by it depends on the salts rather than the colchicum. I have made many other trials of these and other purgatives, and feel assured that, although colchicum often induces a free action of the bowels at the time that relief from pain is obtained, still this is not an essential element in the production of its beneficial effects.

Does colchicum act as a sedative on the vascular system, and thus relieve the inflammatory action? It undoubtedly does produce a sedative action on the heart and other parts of the circulating system, and this is manifested by the slowness, as also by the weakness, of the pulse.

Dr. Maclagan found that 20 minims of colchicum tincture reduced his pulse on one occasion in 4½ hours from 87 to 65, and on another occasion in 6 hours, from 84 to 62. No other physiological action was manifested, except slight nausea.

If the value of colchicum depends solely on its sedative property, we should expect to find this drug equally efficacious in other inflammatory affections; now, although it possesses, perhaps, some controlling power over inflammation which is not gouty in character, this is by no means well marked, and is not at all equal to that produced by other medicines, as tartar emetic and calomel; furthermore these latter remedies, so powerful in other diseases, exert no very decided influence over gouty inflammation.

If the action of colchicum cannot be explained either by its purgative properties or its sedative influence on the vascular system, we are naturally led to seek if its effect on the kidneys and the urinary secretion will afford any clue to its modus operandi. Hence the questions arise: Does colchicum act as a diuretic? Does it cause the elimination of uric acid from the blood, or its destruction when already formed? or, lastly, Is its influence solely exerted upon the tissues in which the deposited urate of soda has given rise to inflammatory action?

Sir R. Christison found that, after giving colchicum to a patient for two days, the quantity of urea was nearly doubled; before taking the drug the urine had a specific gravity of 1020, contained two per cent. of urea, and was free from any deposit of urates; but, during the first and second days after commencing the medicine, the urine was of the densities 1033·5 and 1034, was turbid from urate of ammonia, and the second specimen yielded at least 3·5 per cent. of urea. At first sight this experiment would appear to show a marked influence of colchicum in increasing the elimination both of urea and uric acid, but on further investigation a source of error will be discovered. Christison took specimens of urine for analysis, without reference to the quantity passed in the twenty-four hours, so that although, after the administration of the colchicum, a given sample was richer in urea and uric acid, no proof was afforded that the total daily elimination of the principles was augmented; on the contrary, they might have been decreased, for a notable diminution in the quantity of the urinary secretion often occurs after the purgative action of colchicum.

Dr. J. McGrigor Maclagan, who made similar experiments, arrived at like results, the analyses being made on specimens of urine passed at particular times of the day, but there was no attempt to show the daily average of these principles.

As closely connected with the subject I may mention that Professor Chelius, of Heidelberg, made some experiments, the results of which are apparently in favour of the idea that colchicum gives relief by increasing the secretion of uric acid. He found in one case that the quantity of uric acid was nearly doubled in the space of twelve days; but it must be remembered that the observations were made on a gouty subject, and one recovering from a recent attack of the disease, circumstances which alone would be sufficient to vitiate the experiments; for during convalescence the same phenomenon may occur without the administration of any medicine.

In opposition to these statements it should be remarked that Dr. Graves regards the power of colchicum as due to its lessening the formation of uric acid in the system, and not to its increasing its elimination by the urine.

I have made the following observations with the view of ascertaining the action of colchicum upon the urinary secretion.

The first was on a man, W. L., aged 30, suffering from a slight chronic eczematous eruption; at the time the examinations were made he was placed upon a regulated diet, and the urine carefully collected.

Before taking colchicum :—

Oct. 30.—Urine,	56 fl. ozs.;	sp. gr. 1016.	Uric acid in 24 hrs.	=8·73 grs.
,, 31. ,,	64 ,,	,, 1014.	,, ,,	=7·9 ,,
Nov. 1. ,,	84 ,,	,, 1012.	,, ,,	=8·09 ,,
,, 3. ,,	66 ,,	,, 1016.	,, ,,	=8·18 ,,

Average : Urine, 68·5 fl. ozs. Uric acid=8·24 grs.

When taking colchicum :—

Nov. 4.—Urine,	56 fl. ozs.;	sp. gr. 1015.	Uric acid in 24 hrs.	=6·05 grs.
,, 5. ,,	56 ,,	,, 1016.	,, ,,	=8·51 ,,
,, 6. ,,	46 ,,	,, 1020.	,, ,,	=8·00 ,,
,, 7. ,,	56 ,,	,, 1016.	,, ,,	=6·61 ,,
,, 9. ,,	54 ,,	,, 1021.	,, ,,	=9·18 ,,

Average : Urine, 55·6 fl. ozs. Uric acid=7·67 grs.

The next patient was a young man. C. W., aged 19, suffering from a chronic affection of the upper lip (elephantiasis); general health pretty good. During the time the analyses were made the diet was uniform, every precaution being taken to secure accuracy in the results.

Before taking colchicum :—

Jan. 13, 1854.—Urine,	55 fl. ozs.;	sp. gr. 1017.	Uric acid in 24 hrs.	=7·91 grs.
,, 14 ,, ,,	28 ,,	,, 1027.	,, ,,	=4·48 ,,
,, 15 ,, ,,	30 ,,	,, 1027.	,, ,,	=3·00 ,,

Average : Urine, 37·7 fl. ozs. Uric acid=5·03 grs.

When taking colchicum (half a fluid drachm three times a day) :—

Jan. 16, 1854.—Urine,	47 fl. ozs.;	sp. gr. 1015.	Uric acid in 24 hrs.	=1·34 grs.
,, 18 ,, ,,	23 ,,	,, 1024.	,, ,,	=7·55 ,,
,, 19 ,, ,,	24 ,,	,, 1025.	,, ,,	=7·24 ,,
,, 20 ,, ,,	13 ,,	,, 1031.	,, ,,	=5·00 ,,
,, 22 ,, ,,	19 ,,	,, 1027.	,, ,,	=5·34 ,,

Average : Urine, 25·2 fl. ozs. Uric acid=5·29 grs.

The colchicum was taken three times a day for two days; on the occurrence of purging, one dose was omitted; the two doses each day were sufficient to keep up a free action of the bowels.

The third case was that of a gouty man, B. F., who during five days, when not taking any medicine, passed the following amounts of uric acid: 1·30 grains, 1·95 grains, 2·73 grains, 2·14 grains, and 3·05 grains. Colchicum wine was afterwards administered in half drachm doses three times a day, combined with calcined magnesia, and was almost immediately followed by a marked improvement in the affected joints.

Under colchicum:—

Jan. 20, 1853.—Urine, 43 fl. ounces; sp. gr. 1011. Acid.
Uric acid in the 24 hours = 2·58 grains.
„ 21 „ Diarrhœa from medicine caused the loss of much urine.
„ 22 „ Urine, 35 fl. ounces; sp. gr. 1012. Acid.
Uric acid in the 24 hours = 3·32 grains.
„ 23 „ Urine, 47 fl. ounces; sp. gr. 1011. Acid.
Uric acid in the 24 hours = 3·99 grains.
On the 21st, the patient took but two doses of the medicine.
On the 22nd, but one, and then discontinued it.
Jan. 26, 1853.—Urine, 74 fl. ounces; sp. gr. 1011. Acid.
Uric acid in the 24 hours = 4·07 grains.
„ 27 „ Urine, 56 fl. ounces; sp. gr. 1011. Acid.
Uric acid in the 24 hours = 3·08 grains.

Before taking colchicum:—

Average amount of uric acid passed in 24 hours = 2·23 grs.

When taking colchicum:—

Average amount of uric acid passed in 24 hours = 3·41 grains.

C. F., a male patient, on half extra full diet, not suffering from any very active symptoms, but having a large abscess discharging urate of soda and pus.

Under the influence of colchicum:—

Jan. 4.—Urine, 57 fl. ozs.; sp. gr. 1012. Uric acid in 24 hrs. = 0·58 grs.
„ 5. „ 44 „ „ 1013. „ „ = 0·06 „
„ 6. „ 44 „ „ 1013. „ „ = 0·00 „

Jan. 7.—Urine,	37 fl. ozs.;	sp. gr. 1012.	Uric acid in 24 hrs.		=0·14 grs.
„ 8. „	48 „	„ 1011.	„	„	=0·00 „
„ 9. „	44 „	„ 1011.	„	„	=0·00 „

The diet the same, but without colchicum:—

Jan. 10.—Urine,	44 fl. ozs.;	sp. gr. 1012.	Uric acid in 24 hrs.		=0·72 grs.
„ 11. „	34 „	„ 1014.	„	„	=0·85 „
„ 12. „	61 „	„ 1013.	„	„	=2·44 „
„ 13. „	55 „	„ 1012.	„	„	=0·00 „
„ 14. „	87 „	„ 1009.	„	„	=0·00 „

The averages being—

Under colchicum.—Urine,	45·6 fl. ozs.;	uric acid	=0·13 grs.
Without medicine. „	56·2 „	„	=0·80 „

J. L., a male, aged 57, has had several attacks of gout; recurring usually at intervals of a year or more; for the first few years the ball of the great toe only was affected, but the disease afterwards travelled upwards. No deposits of urate of soda visible. During the time that the joints were severely affected the urine was scanty and high coloured, giving rise to a red sediment of urates. At the time the quantitative analyses were commenced the patient was suffering from slight affection of the joints, but was free from febrile disturbance.

When not taking medicine:—

Feb. 7. Urine, 26·5 fl. ounces; sp. gr. 1021, at 60° Fah. clear.
Urea passed in the 24 hours=213 grains.
„ 8. Urine, 28 fl. ounces; sp. gr. 1020·5, at 60° Fah.
Urea passed in the 24 hours=199 grains.
Uric acid, a few crystals, too small to collect and weigh.
„ 9. Urine, 37 fl. ounces; sp. gr. 2019, at 60° Fah.
Urea passed in the 24 hours=259 grains.
Uric acid, only a few microscopic crystals.

Under the influence of colchicum:—

Feb. 10. Urine, 38 fl. ounces; sp. gr. 1019, at 60° Fah.
Urea passed in the 24 hours=209 grains.
Uric acid, a quantity too minute to collect.
„ 11. Urine, 32 fl. ounces; sp. gr. 1021, at 60° Fah.
Urea in the 34 hours=244 grains.
Uric acid in microscopic quantities only.

Feb. 12. Urine, 41 fl. ounces; sp. gr. 1019, at 60° Fah.
Urea passed in the 24 hours = 270.
Uric acid, a trace only.
„ 13. Urine, 39 fl. ounces; sp. gr. 1017·5, at 60° Fah.
Urea passed in the 24 hours = 241 grains.
Uric acid, a very few crystals, too small to collect.
„ 14. Urine, 33 fl. ounces; sp. gr. 1021·5, at 60° Fah.
Urea passed in the 24 hours = 259 grains.
Uric acid, a trace.

The patient omitted colchicum at the last date, as some feeling of faintness was induced by its use.

Feb. 16. Urine, 30 fl. ounces; sp. gr. 1020, at 60° Fah.
Urea passed in the 24 hours = 201 grains.
„ 19. Urine, 30 fl. ounces; sp. gr. 1020, at 60° Fah.
Urea passed in the 24 hours = 201 grains.
„ 20. Urine, 42 fl. ounces; sp. gr. 1017·5, at 60° Fah.
Urea passed in the 24 hours = 251 grains.
„ 21. Urine, 51 fl. ounces; sp. gr. 1014·5, at 60° Fah.
Urea passed in the 24 hours = 279 grains.
No crystals of uric acid precipitated by the addition of hydrochloric acid.
„ 22. Urine, 54 fl. ounces; sp. gr. 1013·5, at 60° Fah.
Urea passed in the 24 hours = 250 grains.

Average before taking medicine :—

Quantity of urine passed in the 24 hours = 30·5 fl. ounces.
Amount of urea „ „ = 223·6 grains.

Average during the administration of colchicum :—

Quantity of urine passed in the 24 hours = 36·6 fl. ounces.
Amount of urea „ „ = 244 grains.

Average after omitting the use of colchicum :—

Quantity of urine passed in the 24 hours = 41·4 fl. ounces.
Amount of urea „ „ = 236·4 grains.

The amount of uric acid was in no instance sufficient to collect and weigh.

H. C., a male, aged 51. Had suffered from many attacks of gout, but was not labouring under any acute affection at the time the urine was examined.

Urine before the administration of colchicum :—

Nov. 25.	Urine, 98 fl. ozs.;	sp. gr. 1008.	Uric acid in the 24 hrs.	= 1·96 grs.
„ 26.	„ 72 „	„ 1012.	„ „	= 3·12 „
„ 27.	„ 68 „	„ 1014.	„ „	= 2·72 „
„ 28.	„ 60 „	„ 1014.	„ „	= 3·00 „

Under colchicum (twenty minims of the wine three times a day) :—

Nov. 20.	Urine, 68 fl. ozs.;	sp. gr. 1011.	Uric acid in the 24 hrs.	= 1·81 grs.
„ 30.	„ 66 „	„ 1012.	„ „	= 2·20 „
Dec. 1.	„ 64 „	„ 1012.	„ „	= 2·13 „
„ 2.	„ 72 „	„ 1008.	„ „	= 1·56 „

Average before taking medicine :—

Quantity, 74·5 fl. ozs.; uric acid passed in the 24 hours = 2·70 grains.

Average when taking colchicum :—

Quantity, 67·5 fl. ozs.; uric acid passed in the 24 hours = 1·88 grs.

The subjoined analyses, 71 in number, were made on the urine of a male patient, H. C., 51 years of age, who was admitted into the hospital in November, 1852, suffering from chronic bronchitis, accompanied with much difficulty of breathing: in a short time the symptoms were relieved in a very striking manner on the occurrence of a severe attack of gout in the ball of the great toe, which afterwards extended to the side of the foot and knee. About five weeks after, on readmission for another attack of bronchitis, the examinations of the urine were commenced, the patient at the time having flying gouty pains in several joints. The results, including the amount of urine passed each day, its specific gravity, and the daily elimination of uric acid, illustrate well the disposition which the kidneys acquire in gout of throwing out the acid in an irregular and intermittent manner. In the present case the daily amount of this principle was sometimes as much as eight grains, sometimes as little as two-tenths of a grain. As colchicum was administered during a part of the time, any influence it might have in altering the amount of uric acid would be shown, and it appears from these results, that it diminished rather than increased its excretion, thus confirming the conclusion at which we had previously arrived. The average of the uric acid during the whole time the patient was under the drug being 1·65 grain, whereas when not taking colchicum it was 2·26 grains.

Date.	Quantity and sp. gravity of the urine.		Uric acid passed in the 24 hours.	Circumstances and state of patients.
1852.				
Nov. 25	98 fl. ozs.	1008	1·96 grs.	No medicine.
„ 26	72 „	1012	3·12 „	
„ 27	68 „	1014	2·72 „	Average of uric acid passed per diem = 2·70 grs.
„ 28	60 „	1013·5	3·00 „	
„ 29	68 „	1010	1·81 „	Vinum Colchici, M. xx. ter in die.
„ 30	66 „	1011·5	2·20 „	
Dec. 1	64 „	1011·5	2·13 „	
„ 2	72 „	1007	0·36 „	Average of uric acid passed per diem = 1·39 gr.
„ 3	66 „	1011	0·44 „	
„ 4	68 „	1010	1·13 „	
„ 5	64 „	1010	0·64 „	Vinum Colchici, M. xxx. ter in die.
„ 6	68 „	1010·5	1·70 „	
„ 7	76 „	1010	1·77 „	
„ 8	72 „	1011	0·48 „	
„ 9	70 „	1011	0·47 „	
„ 10	46 „	1012	1·38 „	
„ 11	50 „	1010·5	1·00 „	Average of uric acid passed per diem 1·27 gr.
„ 12	47 „	1012·5	2·82 „	
„ 13	45 „	1012	1·65 „	
„ 14	37 „	1014	1·85 „	
„ 15	51 „	1009·5	1.02 „	
„ 16	45 „	1010	0·90 „	
„ 17	37 „	1011·5	1·35 „	
„ 18	54 „	1007	0·27 „	
„ 19	46 „	1010	0·15 „	
„ 20	57 „	1009	0·19 „	No medicine.
„ 21	51 „	1015	2·21 „	
„ 22	66 „	1012	1·81 „	
„ 23	49 „	1010	0·65 „	
„ 24	35 „	1013	1·75 „	
„ 25	49 „	1011·5	2·61 „	
„ 26	64 „	1008	0·21 „	
„ 27	48 „	1010	0·64 „	

Date.	Quantity and sp. gravity of the urine.		Uric acid passed in the 24 hours.	Circumstances and state of patients.
1852.				
Dec. 28	61 fl. ozs.	1012	1·22 grs.	No medicine.
„ 29	52 „	1013	0.69 „	
„ 30	49 „	1015·5	0·41 „	
„ 31	49 „	1012	0·49 „	
1853.				
Jan. 1	53 „	1015	0·18 „	
„ 2	66 „	1013·5	4·07 „	
„ 3	70 „	1011·5	4·08 „	
„ 4	51 „	1012	3·65 „	
„ 5	50 „	1011	2·92 „	
„ 6	64 „	1010	1·28 „	
„ 7	48 „	1011·5	2·00 „	
„ 8	56 „	1011	3·17 „	
„ 9	55 „	1011·5	2·84 „	
„ 10	55 „	1009	0·18 „	
„ 11	11 „	1030	3·10 „	
„ 12	36 „	1015·5	3·60 „	
„ 13	28 „	1018	2·60 „	
„ 14	47 „	1013·5	2·04 „	
„ 15	53 „	1011·5	3·53 „	
„ 16	43 „	1011·5	3·30 „	
„ 17	35 „	1014·5	5·60 „	Vinum Colchici, ʒss. ter in die. Average of uric acid passed per diem = 30·02 gr.
„ 18	23 „	1019·5	6·20 „	
„ 19	24 „	1022	8·60 „	
„ 20	21 „	1022	5·70 „	
„ 21	50 „	1012	5·00 „	
„ 22	37 „	1008	1·23 „	
„ 23	56 „	1007·5	1·49 „	
„ 24	45 „	1011	3·45 „	
„ 25	52 „	1006·5	0·52 „	
„ 26	30 „	1016	2·00 „	
„ 27	59 „	1010·5	1·96 „	No medicine.
„ 28	57 „	1314·5	4·37 „	
„ 29	50 „	1011	1·17 „	
„ 30	58 „	1012	0·97 „	
„ 31	85 „	1907	not determined.	
Feb. 1	45 „	1012	0·75 grs.	
„ 2	67 „	1012	2·46 „	
„ 3	46 „	1012	1·69 „	

Uric acid passed in 24 hours:—

Maximum of uric acid	8·60 grs.
Minimum	0·18 „
Average	1·96 „
Average without colchicum	2.26 „
Average under colchicum	1·65 „

Quantity and specific gravity of urine :—

Average quantity of urine passed without colchicum	51	fl. ozs.
Specific gravity	1012·5	„
Average quantity under colchicum	51	„
Specific gravity	1011·4	„

Results of analyses.—The results of these observations on the action of colchicum may be thus summed up. In Case 1, where neither gouty affection nor febrile disturbance existed, colchicum appeared to have the effect of slightly diminishing the quantity of urine and likewise of decreasing the excretion of uric acid.

In Case 2, where the circumstances were similar, the influence of the medicine shewed itself in a notable diminution of the quantity of urine, the amount of uric acid being a little augmented. This increase, however, was less than a quarter of a grain, and might arise, at least in part, from the circumstance that uric acid is to some extent soluble in water, and therefore, when the urinary excretion is large, a portion may escape precipitation.

In Case 3, a gouty man recovering from an acute attack, the amount of uric acid was somewhat increased, but not more than frequently occurs in patients under like circumstances, where no medicine is administered.

In Case 4, the colchicum appeared to cause a decrease both of the urine and uric acid.

In Case 5, when the examinations were made both before and after the administration of the colchicum, as also during the time the patient was taking the drug, the amount of uric acid appeared to remain about the same, but was extremely small throughout. The urea was slightly augmented during the action of the medicine. The quantity of the urine was also larger, but little stress can be laid upon the fact, as it continued to increase still more after the drug was discontinued.

In Case 6, the excretion of uric acid became much less, and the quantity of urine also smaller; but in this patient's urine considerable variations were observed, many of them totally irrespective of the action of remedies, a circumstance which renders the figures less valuable.

In Case 8, we find that the amount of urine was the same when the patient was taking colchicum as when no drug was given; but the quantity of uric acid was notably diminished during its administration.

Besides the results we have just detailed, we have, in the chapter on the urine, given several other analyses, showing the influence of colchicum upon the urinary secretions. Thus, among the cases of acute gout, we find the patient (Case 4) was under the marked influence of colchicum on the 19th and 20th of February, and the peculiarity of the urine consisted in its containing a very small amount of uric acid compared with that present during the time the inflammation was severe. In Case 5, colchicum was given during the whole course of the attack, but as the dose was rather small, and the man had been long accustomed to its administration, the daily alteration of the uric acid probably depended rather upon the different phases of the disease than the influence of the drug. Among the patients suffering from chronic gout it will be seen that in Case 11 colchicum was administered with the apparent effect of diminishing the excretion both of uric acid and urea.

From a general review of the results obtained in the preceding analyses, we are compelled to draw the following conclusions.

First. There is no evidence that colchicum produces any of its effects upon the system by causing the kidneys to eliminate an increased quantity of uric acid; in fact, when the drug is continued for any lengthened time, it appears to exert a contrary effect.

Secondly. We cannot assert that colchicum has any influence upon the excretion of urea or the other solid ingredients of the urine.

Thirdly. Colchicum does not act as a diuretic in all cases; on the contrary, it often diminishes the quantity of urine, more especially when it produces a marked effect upon the alimentary canal.

Boeker's observations on this subject made in 1849 appear to indicate that colchicum rather decreases the elimination of urea and uric acid by the kidneys.

Christison's observations would probably have agreed with many of my own had I taken for analysis particular portions only of the daily urine, for Case 2 might have been made to show that the uric acid was more than doubled by the remedy, although in reality there was no increase in the daily elimination. I am therefore inclined to think that the statements relative to the increase of uric acid from the exhibition of colchicum have arisen either from the disease having become altered in phase during the examinations, or that erroneous deductions have been drawn from the analyses having been confined to portions only of the daily urine.

As the operation of colchicum cannot be explained either by its purgative effects or by its power of altering the character of the blood and urine, its real mode of action is still a subject for inquiry, and well worthy the attention of the therapeutist. Some have suggested that it may act on the nervous system as a sedative, but such an explanation is of so general a character that it applies to many drugs besides colchicum. Others have imagined that its power is due to the influence which it exerts on the peculiar structures implicated in gouty inflammation, namely the ligamentous and cartilaginous tissues; this may possibly be correct, for we know that certain sedatives control the heart or central organ of the circulating system, others, the capillaries or extreme portions, and it may be that those tissues of which the vitality is low are peculiarly affected by the drug in question. Should this be the case, we should naturally expect to find inflammation of the same tissues, when not of a gouty character, controllable by means of colchicum, and that gouty symptoms when not connected with such inflammation, are not so influenced; but before the subject can be considered definitely settled, much further clinical experience is needed; there are, it is true, many obstacles to the inquiry, and not the least of these is the difficulty of positively ascertaining if, in our comparative trials, the affected tissues are always the same.

Although colchicum may possess some power over rheumatic inflammation, it assuredly does not exert the specific action exhibited in cases of true gout; but it might be argued that the structures affected in the two diseases are not precisely the same.

Dr. Charcot, from his own observations, agrees with me in thinking that colchicum has but little power over rheumatic inflammation.

It is asserted by some that colchicum possesses the power of rendering the urine neutral, or even alkaline: that such is not an invariable effect my own observations prove; but as the examinations were made on the whole day's secretion, and urine rapidly changes, the amount of this influence could not be ascertained.

Without attempting at present to explain how colchicum acts in controlling gouty inflammation, I shall content myself with asserting that it does so in a most marked degree; this is placed beyond doubt by the evidence already adduced, which could be strengthened, if necessary, by further proof, especially by the fact that sufferers from gout are constantly in the habit of taking colchicum, not only without consulting their medical advisers, but even contrary to their injunctions.

The great popularity of different quack preparations, such as Eau Médicinale, Wilson's Tincture, and Reynolds' Specific, all of which owe their efficacy to colchicum, points to the same conclusion; and I believe we may safely assert that colchicum possesses as specific a control over true gouty inflammation as cinchona barks or their alkaloids, over intermittent fever. The evidence hitherto adduced of the power of colchicum in alleviating the urgent symptoms of gout, has not in any way proved that it may not be injurious in its after-effects, and the determination of this point is fraught with interest. Scudamore, in alluding to Eau Médicinale, of which he had often witnessed the effects, remarked that it had been the fruitful source of many cases of chronic gout, by enfeebling the nervous system, and occasioning a degree of despondency and languor never before experienced; he furthermore asserted that he had found no cases of gout so tedious and intractable as those which had been thus empirically treated.

Notwithstanding these remarks with regard to the Eau Médicinale, Scudamore was himself in the constant habit of prescribing colchicum, and has stated in some of his writings, that it must be admitted to be a valuable medicine by all who have had sufficient opportunity of putting its merits to the test.

Other physicians have expressed themselves strongly on the subject of the injurious effects of colchicum; for example, Dr. Petit had an idea that it caused gouty attacks to become more frequent and chronic; and the late Dr. Todd in his clinical lectures expresses a similar opinion, for he remarks, that although colchicum shortens the duration of the fits, it also diminishes the interval between the attacks, and the system gets accustomed to its use as it does to opium, and therefore the dose must be increased in order to keep up the effect. This statement, however, requires to be modified, for sometimes colchicum appears to be cumulative in its action. I always make it a rule, if it is desirable for a patient to continue the drug even in small doses, to require its suspension, at least one week in each month. It is curious to find that Paulus Ægineta, in reference to the use of hermodactylus in gout, says, that although it generally removes the symptoms within two days, it injures the stomach and produces loss of appetite, and should therefore be used only by those who are engaged in urgent business.

In antagonism to these authorities, there are many physicians of the highest eminence who regard colchicum as a remedy of the utmost value in the treatment of the varied manifestations of gout; among these I may mention Sir Thomas Watson, who, in his Lectures on the Practice of Physic expresses himself very decidedly on the subject. With regard to the acute paroxysm, he remarks that colchicum, judiciously given, may be fairly accounted a specific; and again, "This drug has certainly the property of easing, in an almost magical manner, the pain of gout. How it operates is not so clear. It is apt to produce nausea, faintness, and diarrhœa; but its curative influence is not conditional upon the occurrence of these symptoms. Sometimes the rapid disappearance of the gouty inflammation is its only perceptible effect. The patient may be in helpless agony with a tumefied red-hot joint, to-day; and walking about, quite well, to-morrow. The colchicum is, therefore, plainly an anodyne." And as to its use in the more chronic forms, the same author observes, "I apprehend the proper way to eradicate the lurking residue of the mischief is to continue to give small doses of the colchicum; five minims of the wine, for instance, two or three times a day for a while." And lastly, that he looks upon its proper use in the intervals as likely to be attended with beneficial effects, will be evident from the following passage:—"As I think that the dregs, if I may so speak, left behind it by a gouty paroxysm, may be dispersed by the continued use of what, in the usual acceptation of the word, I may call alterative doses of colchicum (doses, that is, which produce the desired purpose gradually, and by insensible operation), so I think it probable that many a fit of the gout might be averted, if the remedy were given in the same way upon the first occurrence of the ordinary premonitory troubles."

Although I confess that a still more searching investigation, not only of the mode in which the action of colchicum is produced, but likewise as to the real effects of the remedy under different circumstances, is to be desired, and will one day, I trust, be successfully undertaken, still, as the result of long-continued observation, I am of opinion that the following propositions may be looked upon as established, and acted upon with safety.

First, in acute gout.—Colchicum has a specific power over true gouty articular inflammation, and may be given with advantage under such circumstances. It seldom fails to allay quickly all inflammatory symptoms, without the necessary production of any sensible physiological effect.

If cathartic action be required, it is better to combine some aperient with the colchicum, and not to trust to the influence of the latter drug, for when much purging and vomiting result from colchicum, nervous and vascular depression likewise follows.

It is of advantage to give a full dose of colchicum at the commencement of the treatment; for example, half a drachm to a drachm of the wine, and to follow it up by smaller doses, as from ten to twenty minims two or three times a day, carefully watching its effect on the pulse, and never allowing the production of sickness or depression.

Colchicum, when injudiciously administered, gives rise not only to nausea, vomiting, and extreme depression, but occasionally to a very obstinate and peculiar kind of diarrhœa.

When great depression is produced by colchicum, gout is apt to recur soon after the patient has rallied from the effects of the drug.

In acute gouty cases the influence of colchicum should be continued in a mild and gradually diminishing degree for several days after the inflammation has subsided.

When colchicum is carefully prescribed, it has no tendency to lessen the intervals between the gouty paroxysms or to render the disease chronic in character.

Secondly, in chronic gout.—Colchicum may be advantageously given in the exacerbations of chronic gout, but this should be done with great care, as there is less occasion to alleviate pain, and the patient is generally not so able to bear a lowering treatment; at the same time, it must be remembered that those who have taken colchicum for a lengthened period acquire a certain tolerance of the drug, a circumstance to be considered in apportioning the dose.

Thirdly, in the intervals between attacks of gout.—There is some evidence and considerable authority for regarding colchicum as effectual in warding off an attack of gout, especially when an approaching fit is beginning to manifest itself.

Colchicum may often be administered with advantage to gouty subjects as a cholagogue in lieu of the preparations of mercury.

Value of different preparations of Colchicum.—The last question in relation to colchicum that requires discussion refers to the preparations best suited for employment, and upon this subject it is well that I should make a few observations. Whether the power of colchicum be due to its containing an alkaloid, as stated by Geiger and Hesse, or a neutral crystalline body, as asserted by Oberlin, it is a matter of the highest probability that the same active principle pervades the whole plant, so that whether the powdered corm, or its wine or extract, or the tincture of the seeds or flowers be made use of, the very same remedy is virtually administered. This fact being established, much of the discussion regarding the relative virtues of the different preparations of the plant, although of high importance to the pharmacopolist, will possess but little interest to the therapeutist. It will be found, when watching the practice of those best able to judge of the effects of remedies, that one physician employs a preparation of the corm, another of the seeds, and a third of the flowers, and all are fully satisfied with the effects obtained; although it is true that some of the preparations are more powerful, dose for dose, than others, yet the difference is easily explained from the quantities of the drug made use of in their formation, as well as from the varying strengths of the different parts of the plant.

I have frequently prescribed with good and uniform effect an amorphous form of *colchicia* obtained from Germany, and the dose which has been found to answer best has varied from a thirtieth to a fifteenth of a grain, dissolved either in water or some aromatic vehicle. The only objection to its use is the absence of crystallization, and I should feel much interest in substituting M. Oberlin's crystalline neutral principle, which appears to be contained in the amorphous colchicia. In making use of such a preparation we might feel assured that we were prescribing the drug in definite doses, without fear of the activity being influenced by season, soil, or any of the other circumstances which are liable to cause considerable alteration in the strength of the galenical compounds.

The preparations of colchicum which I have been commonly in the habit of employing are the wine and an extract of the corm: the former is an advantageous form when the medicine is given as a draught, the latter when it is administered as a pill.

I am fully persuaded that all the good effects derivable from the plant can be obtained from these two preparations, still others may at times be advantageously prescribed, as the simple and ammoniated tinctures of the seeds: the latter is useful when it is desirable to combine a vascular stimulant.

Most of the preparations have had their advocates; the acetic extract was introduced by Scudamore, who considered it milder in its action than any other form, from the acetic acid exerting a modifying power over the active principle. It may, however, be regarded as a fact, that all the effects of the drug can be obtained from the proper administration of any one of its galenical forms, but it must be borne in mind that some are much more active than others.

A mode of giving colchicum, commonly employed, and answering more than one indication, is to prescribe a draught containing colchicum wine, carbonate and sulphate of magnesia, dissolved in some aromatic water. By means of such a combination we produce not only the specific influence of the colchicum, but at the same time keep up the secretion of the bowels and kidneys, and augment the alkalinity of the fluids.

White Hellebore.—Veratrum album, or white hellebore, has been prepared and used in place of colchicum, and a preparation of it with opium was at one time proposed as a substitute for the celebrated Eau Médicinale. The white hellebore is a plant belonging to the same natural order as the colchicum, and the rhizome, the part employed in medicine, contains an alkaloid named veratria, a principle which is occasionally employed as an external remedy. Veratria was formerly supposed to be identical with the active principle of the colchicum autumnale, and hence it was natural to suppose that hellebore might possess a similar action to colchicum. It has however been recently proved that veratria and colchicia are not identical, that the former is much more irritating than the latter, and differs from it in chemical properties.

Scudamore, who appears to have been a witness of its effects, thought that the white hellebore was too dangerous a medicine to be commonly employed, and that it could seldom be given with prudence to gouty patients; that even in careful and graduated doses it often caused serious hypercatharsis, great depression of strength, spasms, and cold sweats, and in some instances, tremors, faintings, and the sensations of approaching death. I have had some opportunities of ascertaining the value of the white hellebore, as also of the alkaloid veratria in the treatment of gout, and the following case well illustrates the action of the latter:—

June 18, 1854.—A patient 50 years of age, who had long suffered, and had gouty deposits and much distortion of the joints, was attacked at the above date with a severe fit; there was swelling and pain of both feet and the right hand, and many of the smaller joints of the left hand and the elbows were more or less implicated. Pulse, 96; thirst. Ordered to take at 5 p.m. a draught containing $\frac{1}{16}$ grain of veratria dissolved in an ounce of water with the aid of a few drops of spirit.

The draught produced some slight nausea, but no other symptoms; at 10 p.m., $\frac{1}{12}$ grain of veratria was given, vomiting of a dark-coloured matter took place during the night, and the bowels, previously much confined, were relieved, partly perhaps by the veratria, but he had previously taken an ordinary senna draught.

June 19.—Patient feels easier in all joints, but especially in left hand. Pulse 72, not full or hard; thinks he became relieved after the veratria. Ordered to take $\frac{1}{16}$ grain of veratria at 4 p.m.

June 20.—Has taken three doses of veratria, no feeling of sickness, but a cup of tea has been vomited; many of the joints much more painful. Pulse 84, fuller. To take $\frac{1}{8}$ grain of veratria three times a day.

June 22.—After taking three doses of the medicine felt intense thirst, burning and dryness of the mouth, but no purging or vomiting; the joints were worse than before. Since omitting the medicine, less thirst and dryness of the mouth and throat. Bowels open to-day, from a dose of house medicine.

The patient was then ordered a colchicum mixture, and after having taken it for 24 hours, the joints were greatly relieved.

Judging from this case, it would appear that the action of veratria, although carried to the extent of producing disagreeable thirst and dryness of the mouth, is attended with no real alleviation of the gouty symptoms; the slight improvement at first experienced by the patient probably arose solely from the relief of the bowels; but the colchicum subsequently administered rapidly removed the articular disease, without the production of either thirst or dryness.

I have witnessed the administration of the wine of white hellebore, followed by a similar result; it produced a burning sensation of the œsophagus, parched mouth, and intense thirst, accompanied by great depression, but without any alleviation of the gouty symptoms.

The difference between the active principles of colchicum and hellebore was well exemplified by some observations made by MM. Geiger and Hesse on the lower animals.

I think we may with confidence conclude that, although white hellebore belongs to the same natural order as colchicum autumnale, its physiological and therapeutic properties are by no means the same, and furthermore that it is not a desirable remedy in the treatment of gout.

Green Hellebore.—Helleborus viridis, or green hellebore, a ranunculaceous plant, has also been used instead of colchicum. I have in several cases of gout employed a tincture of the rhizome of this plant, and although I have increased the dose up to the point of causing distinct physiological symptoms, still in no instance have I seen any marked improvements in the gouty symptoms, although in all the cases the subsequent administration of colchicum was followed by rapid recovery.

Laville's Tincture.—During the last 18 years or so, a secret preparation known by the above name has been much used in this country, and to an extent which warrants my taking some notice of it here. It is stated to be a peculiar preparation of cinchona and colocynth, and to be free from colchicum; but, unfortunately, no stress can be laid upon such statements in regard to secret medicines. It is ordered to be given in teaspoonful doses at the commencement of an attack of gout, and the doses to be limited to three, at intervals of about 8 hours. It sometimes produces nausea, and often considerable purging, but at times neither one nor other symptom is evidenced; but in almost every case, great and sometimes even magical relief is given to the sufferer, and if the tincture is taken when little more than a threatening of gout is present, the development of the attack is often prevented. So far, all appears favourable; but through a long experience I have found that patients almost invariably give up its use after a few years, and some who at first were most enthusiastic in its praise, have become the greatest advocates for its disuse, and have often abhorred its very name.

Although I have never prescribed it, as I carefully avoid giving secret remedies, still it has fallen to my lot to see its effects on several patients. It appears to me that a teaspoonful of Laville's tincture acts very much in the same way as a large dose of colchicum, giving quick relief to the gouty pains and causing rapid subsidence of the inflammation, as described in the early part of this Chapter; and I fail to detect the difference of action between the two remedies, except that the Laville is more apt to cause purgings than any dose of colchicum I should feel justified in prescribing. I believe three large doses of colchicum given in the same way as

Laville's tincture, with the addition of a purgative, if necessary, would accomplish the same end. I do not think the moderate use of the Laville necessarily very injurious, but it is its reckless employment which is to be so much deprecated.

It is not uncommon for gouty people always to keep by them a supply of this medicine, and, whenever a twinge of their ailment is felt, to have recourse to it; finding it so potent in warding off attacks, they are soon led to break through the restraints which have been put upon them as to diet and regimen, and thus the necessity of having recourse to the remedy becomes more and more frequent, and a larger quantity is required to produce the same results. By these means the nervous system becomes much weakened, and, when a severe attack comes on, the medicine not unfrequently fails altogether to relieve. I have on more than one occasion been summoned to see patients in this condition, suffering severely from gouty inflammation, and made more prostrate by each successive dose, but without its producing any amelioration of their symptoms.

In some chemical examinations I made with Laville's tincture in comparison with colchicum, I found that the bitter principle in each had the same solubility in different menstrua, and the colour tests with nitric acid given by a watery solution of the etherial extract closely resembled each other. I am strongly of opinion that Laville's tincture owes its efficacy to the presence of colchicum. Unfortunately the chemical reactions of the active principle of colchicum are not very well marked, and its detection therefore is of necessity difficult.

CHAPTER XII.

TREATMENT OF GOUT:—IMPORTANCE OF TREATMENT IN THE CHRONIC STAGES—MEDICINAL TREATMENT OF CHRONIC GOUT—GENERAL SKETCH OF—VALUE OF SPECIAL REMEDIES—ALKALIES AND SALINES—DILUENTS—LITHIA SALTS PROPOSED AS CURATIVE AGENTS—THEIR SPECIAL ACTION AND ADVANTAGES—ASH LEAVES IN GOUT—TONICS—THEIR VALUE IN GOUTY CASES—PORTLAND POWDER—DISCUSSION OF THE LIABILITY OF TONICS TO PRODUCE INJURIOUS CONSEQUENCES—TREATMENT OF GOUT COMPLICATED WITH KIDNEY DISEASE—TREATMENT OF THE LOCAL AFFECTIONS—ŒDEMA—STIFFNESS OF JOINTS—CHALK-STONES—GOUTY ABSCESSES—EXTERNAL APPLICATION OF LITHIA—DIET AND REGIMEN IN CHRONIC GOUT.

WHEN gout, instead of passing off as an acute fit, lurks about the joints, now attacking one, now another, with moderate intensity, but with the production of much stiffening and distortion, it has assumed a form to which the term chronic gout is applied, and one which requires a treatment considerably different from that recommended for its acute manifestations. If it be necessary in acute gout to make the treatment dependent in a measure upon the peculiar state of the system or the idiosyncrasy of the patient, it becomes a matter of much greater moment to attend to these circumstances in prescribing for the chronic forms; for a treatment, which in one case would be attended with essential advantage, in another might prove not only useless, but positively injurious. In one patient the development of the gouty symptoms may be intimately associated with the state of the skin; in another, with a morbid condition of the stomach, liver, and portal circulation; in one class of cases, an augmented formation of uric acid is the chief cause of the malady, whereas in another class the deficient excretion of this principle may be the most important feature. All these considerations must be taken into account in successfully prescribing for patients suffering from chronic gout, and although a general outline of the plan of treatment is capable of being delineated, still the deviations from it are necessarily numerous and must be left to the judgment and acumen of the practitioner.

As we have before had occasion to remark, the use of colchicum in the early attacks of gout has been accused of inducing a chronic condition of the malady; but that such antecedent treatment is not essential for its production I can affirm from my own experience, having met with some instances of chronic gout in patients who had had attacks of acute gout for many years but who had never had recourse to the use of any remedy. In one of these cases, of fifteen years' standing, the fits were at first short and the intervals between them long, but after a time their frequency was increased, their duration prolonged, and the disease assumed a chronic form, accompanied with visible deposits; proving that there is a natural tendency for this disease gradually to assume an obstinate character, even when uninfluenced by medicines.

Although due attention to the condition of the joints must not be lost sight of in the management of chronic gout, still the constitutional treatment is of paramount importance, and should have reference to the morbid condition of the blood and the removal of the impurities with which it is charged. This object is best effected by increasing the activity of the secreting organs, especially of the kidneys and skin; by altering the composition of the fluids, and rendering the abnormal matter less injurious; but above all, by obviating the circumstances which lead to the production of the disease.

With regard to the direct treatment of the inflammatory state of the joints, this can be successfully effected by the administration of colchicum in very minute doses, carefully avoiding depression, and attending to the precautions already detailed; but there are many cases in which other remedies are required, and among these iodide of potassium and guaiacum may be frequently resorted to with advantage. It must be remembered that a low form of inflammation is often kept up in chronic gout from the presence of deposited matter, an action altogether independent of true gouty inflammation, and it is perhaps more particularly in these cases that the new remedies alluded to prove most beneficial.

Iodide of potassium has undoubtedly a marked power in alleviating affections of the fibrous tissues, as is well seen in the relief it affords in the treatment of nodes; in many cases of gout, especially when the inflammation assumes a character similar to that which occurs in rheumatism, this remedy is of great benefit, acting on the fibrous tissues of the joints and removing the ordinary products of inflammation. In sub-acute forms of rheumatism, iodide of potassium is peculiarly indicated when the pains are increased by warmth, and the same indication may be taken as a guide in chronic gout.

I do not consider that iodide of potassium possesses any appreciable power in removing deposits of urate of soda, but nevertheless I look upon it as a valuable agent in many cases. Mr. Spencer Wells states that he has employed the iodide with much advantage when joints have been enlarged, stiffened, and rendered painful by the presence of gouty deposits. The dose of iodide of potassium, sufficient for all the good it is capable of effecting, need not be large, from one to three grains may be taken twice or three times a day, in water, or in combination with other saline remedies.

Guaiacum is a drug which may also be employed for the sake of its specific action on the fibrous tissues, and may be given in chronic forms of gout when the circulation is languid and the pains are relieved by the application of warmth. I have found the greatest benefit in many such instances from this drug, and it is moreover a remedy which may be administered for a long time without producing mischievous consequences; for any unpleasant effects, as nausea or purging, which occasionally result, are at once made manifest both to the physician and patient. Guaiacum may be given either in the form of the Pharmacopœia mixture, or as the simple or compound tincture, the ammonia contained in the latter being often beneficial, as it increases the stimulant action of the guaiacum upon the vascular system. When inflammatory symptoms are present in any marked degree, as shewn by the increase of pain when the patient is warm in bed, then the use of guaiacum is either altogether contraindicated or, at least, it should be administered in combination with iodide of potassium or some other saline.

I have notes of numerous cases of chronic gout in which guaiacum has been employed with striking benefit: it will be sufficient to select one for the purpose of illustration.

1860.—A gentleman, fifty-six years of age, without any known predisposition to gout, experienced the first attack about twenty years since, in the ball of one great toe; there was at least seven years' interval between the first and second fit, and three between the second and third. After this time the intervals were diminished. During the last three years the attacks have been much more frequent, and especially within the preceding six months; the fits have been also more prolonged and the upper extremities have been affected as well as the lower. A small spot of urate of soda can be seen in the helix of the right ear and there is some stiffness of one or two of the phalangeal joints of the fingers. The urine is free from albumen, clear and yielding but a small amount of uric acid when acidulated. The pulse is weak, 84, there is no indigestion, and perspiration is easily induced; he has noticed that all shocks to the system, mental as well as physical, are liable to bring on attacks of gout, and the fits have been more frequent in summer than in winter. Guaiacum was ordered for this patient, in the form of the ammoniated tincture, rubbed up with mucilage, and he was also advised to take, occasionally, a grain of the acetic extract of colchicum, combined with a little quinine. Under the influence of this treatment the progress of the disease became arrested, and now for nearly two years he has been but slightly troubled with gouty symptoms.

I have now for twenty years or more employed guaiacum very extensively in the treatment of chronic gout, I believe in some thousands of cases, and there is no remedy of which I can speak so confidently. I have known patients who had been confined to their beds for many weeks with asthenic chronic gout, so far recover within two or three days under the use of this remedy as to be able to walk about. One remarkable case came under my care some years since. A gentleman, the year before I saw him, had kept a record of his case, and had been in bed 158 days; he then took a guaiacum mixture for a twelvemonth, and during that period remained entirely free from any attack of gout.

Another patient, an elderly gentleman, who had been accustomed to have two or three pretty severe attacks of gout each year, commenced taking guaiacum, and continued its use for two years and three-quarters, during which time he was entirely free from the disease. I could relate many hundreds of similar cases in which guaiacum has proved extremely valuable: in some its action is almost magical. I have frequently ordered a combination which has proved most efficacious, and being in the form of a powder, of which a few grains may be taken in a wineglass of water, patients have been induced to persevere in its use for a long time. The powder consists of eight parts, by weight, of yellow cinchona bark, six parts of guaiacum, two parts of carbonate of ammonia, two parts of citrate of potash or citrate of lithia, one part of iodide of potassium, and one part of colchicum corm; about 40 grains of this powder may be taken once a day in water, continuously or in alternate weeks; if constipation is troublesome, the powder often is sufficient to act as a gentle aperient.

Other stimulant remedies, as *serpentary*, may be given to effect the same objects as guaiacum, either in the simple form, or united with mezereon as in the compound decoction of sarsaparilla, which combines the virtues of these drugs with those of the sarsaparilla itself, and is a convenient method of exhibiting them.

Sulphur is likewise occasionally prescribed in chronic forms of gout, and is often useful, especially when the function of the skin is defective, and when there is a torpid action of the alimentary canal and its appendages. It is sometimes combined with magnesia, which increases its purgative action, and at the same time acts as an alkaline remedy.

To remove the abnormal state of the blood which invariably exists in chronic gout, and to restore the circulating fluid to a state of purity, must be our next object. It will be remembered that the presence of urate of soda in the blood has been shown to depend on two causes; first, an undue formation of it, arising from some form of dyspepsia or mal-assimilation, secondly, its deficient excretion from the renal organs. These causes are often found combined, but in some gouty subjects the first is most prominent, in others, the second, consequently our treatment must be modified to suit the different cases. The undue formation of uric acid will be found to be especially influenced by diet and regimen, whereas its deficient excretion is more under the control of remedial agents; upon the latter we shall first discourse, but, previously to so doing, I cannot help alluding to Sydenham's advice with regard to the treatment of gout, in which he remarks, that remedies, to be of service, must be steadily and perseveringly adhered to; that a change of the whole system is required which no sensible man can believe is possible to be effected in a short time: he then goes on to say, "For years together a man has drunk and feasted—has omitted his usual exercise—has grown slow and sluggish—has been over studious or over anxious,—in short, has gone wrong in some important point of life. In this case he has, as it were, taken trouble to pervert the various ferments of the body, and to smother the animal spirits, which are the primary instruments of concoction. Hence the humours preternaturally accumulated break forth, after having become exalted in the highest degree. They destroy the system. The muscles are softened and the joints relaxed, so that the affluent humours are readily received. A new nature is now superinduced, the original and natural economy of the body being altogether broken up and destroyed. The fits that seem so important in the eyes of the party, are nothing more than the series and order of symptoms which nature uses in the expulsion of morbific matters. Hence, to use any medicines for a short time is a waste of labour. The weakness of all the digestions, and the loss of natural strength in the several parts, are the essence of gout. Each must be dealt with."

The remedies best adapted to purify the blood are those which increase the activity of the secreting organs, more especially the kidneys; as also such as possess the power of rendering the presence of the urate of soda less injurious by preventing its deposition in the tissues or removing it when already infiltrated; for these purposes alkalies and salines are peculiarly called for, and many of them are of sufficient importance to demand a special inquiry into their nature and mode of action.

Alkalies and Salines.—Alkalies and salines have long enjoyed reputation in the treatment of chronic gout; Boerhaave and Hoffman recommended them to be taken in small and frequently repeated doses for a long while, and employed the ashes of different plants, burnt either to blackness or whiteness; for example, broom ashes dissolved either in water or Rhenish wine: they also used the alkaline earths for the same purpose. Cullen remarks that, when some fixed alkali, either in a mild or caustic state, or lime-water, soap or absorbent earths, have been given in nephritic or calculous cases to patients who were at the same time subject to gout, it has been observed that, under the use of these medicines, they have been longer free from the fits of the latter disease. He adds, that he does not know if, when very long continued, they would prevent the returns of gout, as he had never ventured to give them for so long a period, through fear of producing a hurtful change in the blood. Dr. Wollaston, in alluding to his discovery of the real nature of gouty chalk-stones, and in referring to the opinion just quoted, says, "The knowledge of this compound may lead to further trial of the alkalies, which have been observed by Dr. Cullen to be apparently efficacious in preventing the returns of this disease; and may induce us, when correcting the acidity to which gouty persons are frequently subject, to employ the fixed alkalies, which are either of them capable of dissolving gouty matter, in preference to the earths, which can have no such beneficial effect."

Dr. Wollaston was in error when he stated that the earths had no power of dissolving gouty matter, for both magnesia and lime have been recommended in gout, and cases are on record in which gouty attacks appear to have been kept off for some time by steady perseverance in their exhibition.

Some physicians, on the other hand, have had no confidence in the administration of alkalies; but it will be found that the opponents as well as the partisans of these remedies, have been considerably biased by their respective ideas of the nature of the disorder; upon the whole, the recorded facts are in favour of benefit having been derived from their use.

In my remarks on the value of alkaline remedies, I shall include not only the alkalies and their carbonates, but also such neutral salts as the citrates and tartrates, which are decomposed in the blood and render the urine less acid; in addition to these I shall speak of certain other saline substances, as the phosphate of soda and phosphate of ammonia, which appear to exert a specific action upon the renal and cutaneous secretions; but, before entering at length into the value of these remedies, it will be advisable to say a few words in reference to the difference of action which they respectively exert.

It must be remembered that when caustic potash is administered in the form of the solution of potash, the amount of the alkali introduced into the system is usually exceedingly minute, and its influence is probably exerted chiefly upon the mucous membrane of the stomach and its contents, and it therefore acts simply as a local sedative and direct antacid, the quantity of the alkali absorbed being insufficient to render the urine either neutral or alkaline. But when the carbonates and bicarbonates of the alkalies are given, so much of the salts may be introduced into the stomach as not only to neutralise the acidity of the alimentary canal, but to render the blood more alkaline, and notably alter the secretion of the kidneys, and this is more especially observed after large doses of the bicarbonates.

The same phenomenon is observed when the common phosphate of soda is employed; a salt which possesses an alkaline reaction and passes through the system apparently unchanged.

In the case of the citrates and tartrates the effect is different. These salts are neutral, and do not therefore possess the power of neutralising acid in the stomach, but, after their absorption into the blood, they are decomposed by the oxidation of the vegetable acids, with which the alkali is combined, and afterwards thrown out by the kidneys in the form of the carbonates of their respective alkalies.

As yet we have spoken of all the alkaline salts as exerting the same influence, but this is only correct up to a certain point, beyond which a difference of effect is distinguishable. Looked upon physiologically, potash salts act more especially upon the kidneys, and induce powerful diuresis; soda salts influence the liver more than potash salts, but act less upon the kidneys; and in a chemico-physiological point of view, the uric acid of the blood and urine is rendered much more soluble by the potash salts than by the corresponding salts of soda.

The influence of the potash salts as diuretics is well shown in some experiments of Professor C. G. Mitscherlich of Berlin, recorded in his Lehrbuch der Arzneimittellehre. This physician gave half drachm doses of carbonate of potash, dissolved in six ounces of water, to a man suffering from prolapsus vesicæ. In half an hour the urine became neutral, and in 38 minutes alkaline. The quantities of urine which were secreted in each 20 minutes were as follows, measured in cubic centimeters:—

After the first	20	minutes	32	cubic cent.—	sp. gr.	1020
After the second	20	"	49	"	"	1014
After the third	20	"	75	"	"	1009
After the fourth	20	"	50	"	"	1014
After the fifth	20	"	30	"	"	1018

The total quantity in 1 hour and 40 minutes being 236 cubic centimeters, or a little more than eight ounces. The same patient, when not under the influence of the drug, passed, on an average, less than two ounces in the same period of time.

In another experiment the same man took 16 ounces of pure water, and the urine passed is exhibited in the following table:—

After the first	20	minutes	21	cubic cent.—	sp. gr.	1020
After the second	20	"	26	"	"	1015
After the third	20	"	51	"	"	1006
After the fourth	20	"	56	"	"	1004·5

Thus showing that pure water, although it augments the secretion of the urine, is much less active as a diuretic than a far less quantity of a solution of bicarbonate of potash.

No observations of the action of soda salts upon the kidneys in comparison with the corresponding salts of potash are on record, although the fact of this difference in diuretic action is, I believe, generally admitted.

Potash and soda salts differ also very notably in their influence on the blood, and more especially in their power of imparting solubility to uric acid. This might be at once inferred from the greater solubility of urate of potash, and may likewise be observed in watching the effects of the two remedies in clearing the urine of patients from deposits of urates. The same fact may be illustrated experimentally; if, for example, small portions of gouty cartilage, infiltrated with urate of soda, be placed in solutions of the carbonates of the two alkalies, it will be found that, after the portion treated by the potash has become quite free from the urate, that immersed in the soda solution remains apparently in its original state.

Having established the influence of these salts in rendering the fluids of the body more alkaline, and in causing the solution of the uric acid, it is now a matter of importance to ascertain if the results of clinical experience accord with these facts. I should be inclined to lay great stress on Cullen's statement with regard to the therapeutic value of alkalies in the treatment of gout, because he was unfavourable to the idea of the disease being in any way connected with impurity of the blood, and he makes the statement merely as a result derived from actual experience of cases in which the alkalies were prescribed for a different purpose.

That alkalies are useful in treating acute attacks of gout is a fact recognised by almost every physician, and the exhibition of these remedies in such cases is very common; but it is a question of far more importance to determine whether, if their use be long persevered in, they exert a beneficial influence over the future progress of the disease. It may be well that I should give the result of my own experience upon this point.

First, I am of opinion that alkaline remedies are of much value in the treatment of the paroxysms or exacerbations of the joint affection, and I am constantly in the habit of prescribing them in such cases, either in the form of the bicarbonate of potash, or of the citrate or acetate of the same base. I prefer the potash to the soda salts, because the former possess the same alkaline properties as the latter, and have a greater solvent power for uric acid, in addition to which the production of diuresis is attended with advantage.

In some instances in which magnesia is indicated, I have replaced the potash by this base, but for a short time only.

Next with regard to the continuance of these remedies when no inflammation is present. I am convinced that much benefit may be derived from a judicious administration of salines for a long period; and can bring forward evidence in support of my conviction; but to render the alkaline treatment successful in such cases a particular form of exhibition should be adopted.

If a patient is suffering from chronic gout and is at the time exempt from active inflammatory symptoms, the following rules should be attended to:

The salines should be given in small doses, and repeated two or three times a day.

They should be administered in a very dilute form, and always on an empty or nearly empty stomach, and some hour or more before food.

The nature of the saline must depend on the peculiarities of the case, and it should be changed from time to time.

Small doses are for many reasons preferable to large, when their continued employment is desirable, as they produce no disturbance of the digestive organs, act more freely on the secretions, and are not likely to induce debility, a result occasionally seen if they are given in considerable doses.

It is of much importance that the salines should be dissolved in a large quantity of liquid, and for this purpose I usually prescribe either plain or aërated water. The water itself is doubtless a powerful agent, and, if judiciously employed, of much service as a remedy; it is one perhaps too much neglected by physicians of the present day.

If water be given when the stomach is empty, it is rapidly absorbed by the veins, and quickly eliminated by the different secreting organs, whose functions are thereby greatly excited, and then, along with the augmented watery secretion, matters which would otherwise be retained are thrown out, and the blood thereby rendered purer. I have reason to believe that the increased excretion from any organ is always attended with an augmentation not only of the watery portion, but likewise of the solid matter of such excretion; that when, for example, diuresis is induced by any means, more of the peculiar ingredients of the urine is eliminated at the same time, and that no such distinction exists between different diuretics as has been occasionally asserted; namely, that one class merely augments the watery portion of the urine, whereas the other increases the organic and inorganic solids as well. We have evidence of the value of water as an active medicinal agent in the fact that mineral waters, holding in solution varying amounts of saline matters and salts of very different composition and characters, are almost equally efficacious in relieving the same disease; a circumstance probably depending in a great measure on the powerful influence of the water itself. As the result of numerous observations I am of opinion that the free administration of water at proper periods of the day diminishes the formation of uric acid in the system, at the same time that it promotes its elimination by the kidneys. When, for example, the urine of any patient is increased in quantity from this cause, the uric acid becomes notably lessened, certainly to a degree incapable of being explained by the fact of the solubility of the acid in the fluid, and the greater difficulty of separating it in the analysis. This view accords with the observations of Böeker and Genth, who found a marked decrease of uric acid under the same circumstances.

The reason why dilute saline solutions are more efficacious when taken on an empty stomach arises from their liability to produce dyspepsia if otherwise administered; water itself will often cause indigestion if taken soon after a meal, and the disturbance of the stomach will be further increased if an alkali be dissolved in it.

The choice of the saline is a point of some importance. I am inclined to regard almost all salines as beneficial, but some are certainly more adapted to particular cases than others. When the function of the skin is imperfectly performed, the salts of ammonia are peculiarly indicated, and the phosphate may be employed with advantage; it possesses also considerable solvent power for urate of soda, and there is much clinical evidence to prove its value in the treatment of chronic gout. It was first introduced as a remedy for this disorder by Dr. Buckler, of Baltimore, and since that period has been employed by several physicians with success. For some years I used the phosphate of ammonia rather extensively, and was well satisfied with the results obtained from its employment in chronic gout.

If there be a deficient secretion from the kidneys, the salts of potash are desirable, on account of their diuretic properties; added to which they possess, as before stated, great solvent powers for urate of soda, and I am fully convinced that this latter property plays a most important part in the therapeutic action of the drug.

The phosphates of potash are not much employed, for the salt which corresponds to the common phosphate of soda is not one which is pharmaceutically convenient to administer.

The citrate of potash is also a very valuable remedy, and produces no disturbance of the stomach; it is agreeable to the taste, useful when a direct antacid is not required, and may be advantageously given in the effervescing form. The acetate is less pleasant, but is an efficacious salt and more diuretic than the citrate. The tartrate in the majority of cases is not desirable, from its liability to run off by the bowels.

The salts of soda may also be employed in some cases of gout instead of or along with those of potash; they are far less diuretic, have much less solvent action on the urates, but they influence the liver function; when in gouty patients the action of the liver is defective, I frequently employ the bicarbonate of soda, mixing it sometimes with the citrate of potash. I have however an objection to the long-continued administration of large doses of soda salts in chronic gout, as they appear to me to favour the development of urate deposits.*

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* M. Claude Bernard finds that the salts of soda can be injected into the veins of animals, or mixed with their food in large quantities without injury,

Having frequently prescribed saline remedies in the manner above described, I can speak most favourably of their value in chronic gout. I have repeatedly given them to patients who had for many years suffered annually from numerous severe attacks of the malady, with the effect of keeping them free from its return for a whole twelvemonth, and this exemption has been accompanied with a decided improvement in the general health. Upon the whole, I have found no treatment so efficacious in many cases of uncomplicated chronic gout, and it is one attended with this great advantage, that it can scarcely be regarded in the light of drugging, as no foreign body is introduced into the economy, but merely a slight addition made to the saline matters which are present in many articles of food, which are in fact normal to the constitution of the blood, and even necessary to its healthy constitution.

In the case of a gentleman 50 years of age, suffering from chronic gout and much crippled with chalk-stones, this treatment was followed with such good results that he was able again to enjoy field sports, from which he had been long debarred; and this improvement was in no way favoured by any very rigid adhesion to diet or regimen.

For such treatment to prove successful, it is important that it should not be indiscriminately used, and the cases should be properly selected: it is inappropriate for persons who are either greatly advanced in years, or whose kidneys are so injured and contracted that their power of eliminating the watery portion of the urine is much impaired; and again, it cannot be advantageously em-

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but that the salts of potash cannot be so given without producing injurious effects. M. Galtmann asserts that potash enfeebles and renders slower the heart action, and lessens the reflex excitability of the spinal cord; effects not produced by soda.

ployed when the patient's stomach is unable to bear dilute saline solutions; for if a feeling of distention and weight, or other symptoms of dyspepsia, are induced, the treatment will probably do more harm than good. It sometimes happens that when a simple saline solution does not sit easily on the stomach, it may be made to do so by the addition of some aromatic bitter, and a weak infusion of chamomile or of ash-leaves may be substituted for the water.

The salts of magnesia and lime may be occasionally used; their ordinary employment, in lieu of the alkaline salts, offers no special advantage, but on the other hand may be attended with discomfort; the salts of magnesia being liable to run off by the bowels, those of lime to cause constipation. Instances, however, occur in which the administration of one or other may for a while prove serviceable; in such cases recourse may be had to the solution of the bi-carbonate of magnesia, or lime-water.

Lithia Salts in the Treatment of Gout.—Lithia was first discovered by Arfwedson in 1817, in the mineral Petalite, and was so named from λίθειος, stone-like. It has been since extracted from several other minerals, and has been found in many medicinal springs, as those of Carlsbad, Aix-la-Chapelle, Marienbad, Kissengen, Ems, Teplitz, Bilin, Kreuznach, Vichy, Baden, &c.

The metal lithium, of which lithia is the oxide, is of a beautiful white colour, like silver, readily oxidised by exposure to the air, of a specific gravity about half that of water, lighter in fact than any known solid or liquid. It is also remarkable for possessing a very low combining proportion, its atomic weight being seven on the hydrogen scale.

Lithia, or the oxide of lithium, forms the third fixed alkali, and occurs as a white crystalline substance, having a caustic taste, and an intense alkaline re-action, similar to potash and soda. In some of its characters lithia closely approaches these alkaline bases, in others it more resembles magnesia and lime. The proto-carbonate differs from the alkaline carbonates in being sparingly soluble in water, requiring about 100 parts, but with an excess of carbonic acid it is rendered more soluble. Lithia, when dissolved in 1000 parts of water, yields a solution having a well marked alkaline reaction.

As the equivalent of lithium is small, both the alkali and its carbonate possess great neutralising powers, far exceeding in this respect the corresponding preparations of the other alkaline bases.

One of the most remarkable properties of lithia is its power of imparting solubility to uric acid, the urate of lithia being the most soluble of the known urates. It has been found by Lipowitz, that when the mineral lepidolite is reduced to powder and boiled with uric acid, so great is the affinity of the acid for this base, that urate of lithia is formed, although the alkali was previously combined with silicic acid.

I have found that when carbonate of lithia in excess is boiled with water, the addition of uric acid causes it to dissolve, showing that the urate of the base is more soluble than the carbonate. The salt formed under these circumstances is the bi-urate of lithia, which crystallises in long needles, and corresponds to the salt of soda found in the blood and tissues of gouty subjects.

Urate of lithia is much more soluble in water than any other urate, but to what extent has not been accurately determined. Lipowitz, however, found that one part of carbonate of lithia in ninety parts of water dissolved, at a boiling temperature, four parts of uric acid, with the evolution of carbonic acid, and that the salt so formed, when free from carbonate, dissolved in sixty parts of water.

Mr. A. Ure ascertained that a solution of one grain of carbonate of lithia in an ounce of distilled water, when raised to the temperature of 90° Fahr., with uric acid gradually added in minute portions until it ceased to dissolve more, took up 2·3 grains, a quantity much larger than that dissolved by either carbonate of soda or carbonate of potash. Binswanger also found that one part of carbonate of lithia in 120 parts of water, dissolved at a blood heat nearly four parts of uric acid.

To show the power which carbonate of lithia possesses in rendering urate of soda soluble, I made the following experiment:—A metacarpal bone was selected, having the phalangeal extremity completely infiltrated with gouty deposit; this was placed in a small quantity of cold water, and a few grains of carbonate of lithia added; in the course of two or three days, when the head of the bone was examined, no deposit could be seen, and the cartilage appeared to have been restored to its normal state.

Lithia salts can scarcely be said to have been employed therapeutically until introduced by myself in the treatment of uric gravel, and chronic gouty conditions of the system. Mr. A. Ure had proposed the use of the carbonate as an injection into the bladder, for the purpose of dissolving calculi; and in a paper published in the "Pharmaceutical Journal," in 1843, gives an account of an experiment in which he found that a urinary calculus, composed of alternate layers of uric acid and oxalate of lime, when placed in a solution of four grains of carbonate of lithia in an ounce of distilled water, and steadily maintained at a blood heat during five consecutive hours, lost five grains in weight. The difficulty of procuring the salt prevented Mr. Ure from pursuing his inquiries any further.

In 1858 I commenced the administration of carbonate of lithia as an internal remedy, both in cases of uric acid diathesis connected with gravel, and likewise in chronic gout, and, from what I then experienced, was much satisfied with the results. When given internally in doses of from one to five grains dissolved in water, and repeated two or three times a day, it produces no direct physiological symptom, but, when patients are voiding uric acid gravel, it exerts a marked influence, causing the deposits either to become less or to cease altogether. In many instances in which I administered it to gouty subjects, the result was to diminish the frequency of the attacks, and to improve the general condition of the patients. These observations led me to propose, in the first edition of the present work, the salts of lithia as valuable remedial agents, although I was assured by those most competent to give an opinion on the subject, that it would be almost impossible to procure a single pound of the carbonate of lithia in Europe. A great demand for the salts of lithia soon afterwards sprung up, and the supply has been adequate to the demand. In the first edition of the British Pharmacopœia, 1864, both the carbonate and citrate of lithia were introduced as therapeutic agents.

The value of lithia salts in the treatment of gout and gravel is based, first, upon the great neutralizing power of the alkali, arising from the low equivalent of this metal, and secondly, upon its powerful solvent action upon uric acid; in addition to which its local influence is slight, and its use does not appear to be attended with injurious consequences.

To demonstrate the superior power possessed by carbonate of lithia over the carbonates of soda or potash, in removing the deposits of urate of soda from gouty cartilage, I performed the following experiment. Solutions of the salts of lithia, potash, and soda, were prepared with one grain of each of the dried salts to the fluid ounce of distilled water; into these were placed small pieces of cartilage completely infiltrated with urate of soda, which were allowed to remain for forty-eight hours. At the end of that time, the cartilage taken from the lithia solution was found to have been restored to its natural condition, that from the potash was much acted upon, but that which had been submitted to the influence of the carbonate of soda appeared unaltered.

If the experiments be made with other salts of these bases, as the sulphates or chlorides, the powerful influence of lithia will be at once apparent: when, for example, the sulphate of lithia comes in contact with the urate of soda, decomposition ensues, sulphate of soda and urate of lithia are formed, and any deposit in the cartilage is thus rendered soluble.

In administering the salts of lithia, we should be guided by the following considerations:

They should be given in a freely diluted state, either dissolved in a large quantity of plain water, or, which is preferable, in aërated water, forming *lithia-water*, and corresponding, except in strength, with the soda and potash waters in general use.*

When a large amount of an alkali is desirable, I have usually prescribed the carbonate of lithia in combination with some salt of potash, as the carbonate or citrate, which may be advantageously administered in the aërated state.

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* In potash and soda waters of the Pharmacopœia, 10 grains of the bicarbonates are contained in each bottle of 10 fluid ounces; whereas in the officinal lithia-water only 5 grains of the proto-carbonate are present in the same amount of fluid.

The great bar to the free use of salts of lithia in medicine as yet has been their expense, but in the small doses in which they are usually required, this is seldom a serious objection, and it is one which will be gradually lessened; in fact, at the present time, the cost of the salts is not half what it was when they were first introduced.

Within the last few years the salts of lithia have acquired an additional interest, not only to the chemist, but also to the therapeutist. This interest has been excited by the extensive use which has been made of them in medicine, and by the discoveries of Kirchoff and Bunsen. I will give a short outline of these latter, as far as concerns the scientific physician, and relate the results of my own experience since I first proposed the salts of lithia as therapeutic agents.

By the old methods of analysis it was a matter of considerable difficulty to detect the presence of small amounts of lithia, but Bunsen, by means of the spectrum analysis, has shown that the detection of even the most minute traces of the metal can be easily accomplished, as lithium gives a well marked and characteristic red line, a pale yellow band, and a peculiar blue line at elevated temperatures. It has been shown that lithia, instead of being, as its name implies, a constituent of minerals only, is extensively diffused throughout the vegetable and animal kingdoms, and it has already been detected in the water of the ocean, in many mineral springs not mentioned above, in the ashes of sea-weed, and of many inland plants, as the vine, tobacco, and in the seeds of the gramineæ; also in the milk, blood, and the muscles of the human subject, and of many animals.

Lithia must therefore now be regarded, not as a drug foreign to the economy, but as a normal constituent of the body, and essential to its well-being.

The quantities of lithia existing in the above named substances is small, but it is asserted that in some of the Baden-Baden springs, the Fettquelle and Murquelle, the amount is such as to render these waters not only powerful therapeutic agents, but useful as sources from which to procure the lithia salts.

My own experience of the action and uses of lithia may be thus summed up.

All the salts of lithia appear to be powerful diuretics, in some patients increasing the flow of urine to a somewhat annoying extent; and I have known many instances in which a bottle of lithia-water, taken at bed-time, would cause the patient to be disturbed during the night, whereas the same quantity of soda water would produce no such result.

The carbonate of lithia is, moreover, a very powerful alkalizing agent. In some patients I have seen the urine become distinctly alkaline from the exhibition of five grains of the carbonate dissolved in aërated water, and in numerous cases, I have known the administration of the same salts prevent the deposition of uric acid gravel for an indefinite period of time.

I have also ascertained, from considerable experience, that the proper administration of lithia has a considerable power in preventing the recurrence of gouty paroxysms. In one case a patient about 60 years of age, subject to both gout and uric calculi, by the use of lithic salts continued for seven years, not only prevented the formation of calculi but likewise the recurrence of any gouty attack. I have even known patients who asserted that when taking this alkali they could indulge in wine with impunity. I have also been informed that individuals have lost gouty concretions by the long-continued use of the salts of lithia.

A case is related (Virchow's Archiv and Canstatt's Jahresber., 1864) of a gouty woman, a patient of Dr. Stricker, who had tried several courses of the Wiesbaden waters without being able to get rid of deposits at the ends of her fingers, but succeeded in doing so after fifteen days by taking a mixture of carbonate of lithia and carbonate of soda dissolved in water by the aid of carbonic acid.

If we consider the pathology of the gouty paroxysm, and remember that in every case a deposition of a crystalline substance takes place in the tissues of the part affected ; and if we call to mind the great power of lithia, not only in alkalizing the blood, but likewise in rendering the uric acid soluble in that fluid, we shall have no difficulty in believing that the salts of this alkali may prove most powerful in the treatment of gout, and likewise in other affections, the pathology of which is closely connected with an excess of uric acid in the system.

The citrate of lithia is now extensively employed in medicine, and is a valuable salt when the presence of a free alkali in the stomach is undesirable. It is a very definite crystalline substance, readily soluble in water, and devoid of any disagreeable taste. It exerts no alkaline power upon the stomach, but when absorbed into the blood is readily decomposed and appears in the urine as a carbonate of the base, and thus produces all the remote effects of the last-named salt. It stands, in fact, in the same therapeutic relation to the carbonate as the corresponding salts of potash.

I may mention that although many of my patients have continued the use of lithia salts for a long time, I have never been able to detect any really injurious effects. In two cases I have noticed a slight trembling of one hand produced by their use; in both patients there existed some kidney mischief; and in a third case slight twitching of both arms occurred when the patient was taking very large doses. I have also heard of the case of a gentleman who thought it produced some not well defined nervous symptoms; the patient notwithstanding continued the medicine, as it gave relief to his gout. Dr. Charcot states, in his annotations to the French edition of this work, that he has given carbonate of lithia to the extent of 30 and 45 grains in the 24 hours without the production of any unpleasant symptoms. In larger doses, continued for some days, dyspepsia was often produced.

I wish it particularly to be understood, that I do not consider lithia will in any way replace colchicum as a remedy for gouty inflammation; it may prove a valuable adjunct, but its chief use is in chronic gouty cases, to ward off attacks and remove the remnants of the disease; it is likewise valuable when administered as part of the prophylactic treatment. The use of lithia as an external remedy will be spoken of further on.

Fraxinus excelsior; or, Common Ash.—Different parts of the Fraxinus excelsior have at various times been employed in medicine; the bark was extensively used in the treatment of intermittent fevers before the introduction of cinchona into European practice; it was also employed in scrofulous and gouty affections, and as a remedy against intestinal worms. It is stated, on the authority of Dr. Pouget, that the peasants of Auvergne have employed the leaves as a specific for gout for more than forty years.

M. Larue relates that his mother was suffering in 1840 from a form of disease designated by him as rheumatic gout; she had had it for two years, and it was gradually increasing in severity, accompanied with acute pain, much swelling, and great difficulty in moving the joints. After trying numerous plans of treatment without benefit, she was induced, on the recommendation of her milliner, to drink freely an infusion of ash-leaves. At the end of a fortnight she was relieved, and in a few months cured. M. Larue also states that in many other cases he had tried ash-leaves, and generally with complete success. The mode in which he gave the medicine was as a decoction of from 150 to 300 grains in about six ounces of water, and this quantity was taken night and morning, or every three hours, according to the intensity of the symptoms.

Drs. Pouget and Peyraud consider the leaves of the ash a true specific in the treatment of gout, as not only possessing powerful curative properties, but as being devoid of all inconvenience and danger. As the result of a lengthened experience, they came to the conclusion that within four or five days of their employment, the pains, redness, and swelling were generally diminished, and often completely cured; and they assert that if given for eight or ten days each month, the attacks can be warded off almost indefinitely.

The above statements were made in 1852, and the value of the leaves has been confirmed by a M. Mouchon.

I have made some trials of ash-leaves in acute and chronic gout, employing them in lieu of other remedies, so as to be able to ascertain their true value, and the following is the result of my experience. A gouty patient, about 55 years of age, with chalky deposits on several parts of the body, was seized with a fresh attack, April

24th, 1854; on the 27th of the month he came under my care, having swelling, heat, tenderness, and pitting of the left hand, and the small joints of the fingers and wrist; the left knee was also inflamed, and febrile symptoms were present. He was ordered at once to take five fluid ounces of the decoction of ash-leaves three times a day. On the 29th, having taken the medicine regularly for forty-eight hours, there was no alteration in the symptoms; the left elbow had become much inflamed, and the right ankle slightly so. Pulse 96, hard and full; much starting of limbs; furred tongue; some soreness of left ear, which was sprinkled with nodules of chalky matter; no sleep; bowels open from aperient medicine.

The medicine was then changed at patient's own request, as he stated that, from former experience, he was sure I could give him something which would relieve him. I ordered a colchicum mixture, and the gouty symptoms, within a few hours, were brought under complete control.

The second case resembles the first in many particulars. A man aged 38, who had suffered from gout for several years, and had a few spots of urate of soda on the palmar surface of one index finger, was next subjected to the treatment. The attack was becoming much more severe, and the day previous to his admission into the hospital, one elbow had been severely inflamed, in addition to the joints previously affected. On the 27th of April he was ordered the decoction of ash-leaves, five fluid ounces three times a day, which was taken regularly till the 2nd of May; it appeared to produce some nausea, but the gouty symptoms appeared as before, and the ash-leaves were consequently ordered to be discontinued, and half-drachm doses of colchicum wine substituted. After two days the inflammation of the joints had considerably subsided, and in a very short time the man was free from gout.

These cases gave me little hope that ash-leaves would prove valuable in the treatment of the disease, and led me to doubt the statements which had been made regarding them by Drs. Pouget and Peyraud; but, after administering the remedy in cases of chronic gout, I found reason to modify somewhat my views as to their efficiency.

I have always given the ash-leaves in combination with a large amount of fluid, and am inclined to think that such a mode of administration has a powerful influence, as is the case with different saline substances. I ordinarily prescribe them in the following manner:—

An ounce of the leaves, as kept by the herbalist or druggist, should be boiled for ten or fifteen minutes in about two pints of water, and the decoction taken in divided doses during the day, about an hour before meals; its taste is by no means unpalatable, and several of my patients have drunk it instead of toast-and-water; it is slightly bitter, and appears to increase the appetite and improve the digestive functions.

If the ash-leaf tea does not replace the other liquids taken during the day, diuresis and diaphoresis are induced; sometimes a slight action on the bowels is excited, but ash-leaves given in this dilute form do not ordinarily produce any decided purgative effects.

In illustration of their value, I may mention that I once ordered them for a gouty subject, who had deposits upon the ears and hands, with great stiffness of the joints, and who had for a long time suffered annually from five or six acute attacks of the disorder. By the aid of this medicine he was kept free from gout for more than a twelvemonth, and able to follow his usual occupation.

He also recovered his power of walking, and could take a considerable amount of exercise.

In many other cases I have known good results to ensue, but few patients have persevered sufficiently long with the remedy.

How ash-leaves act, I am quite unable to say. Do they produce more effect than an equal bulk of some other weak vegetable infusions, such as the infusion of chamomile? I believe the decoction sits more easily on the stomach than water, and this alone is a great desideratum; it appears also to act as a stomachic tonic.

In the urine of the patient above alluded to, an increase of the uric acid was observed, but unless confirmed by much further experience I should not be inclined to lay stress upon the fact, as it might have arisen from other causes.

Hot Water.—I have seen several patients suffering from chronic gout receive much advantage from taking, early each morning, at least an hour before breakfast, a tumblerful of hot water, at a temperature which allows of its being sipped with comfort. Now and then this is sufficient to keep the bowels gently acted upon, but as a rule it becomes absorbed and gives activity to the circulation, acting on the skin and kidneys; it is also pretty certain that the impression of the hot water on the alimentary canal excites the flow of bile and pancreatic fluid into the duodenum, and in elderly people improves the whole of the digestive process. At any time, when a more aperient action is required, a small amount of Carlsbad or other salts dissolved in the water is sufficient to effect the purpose.

Cadet de Vaux, from the effects he had witnessed from the drinking of the waters of Plombières, proposed to cure gout by giving waters in doses of six to eight ounces each quarter of an hour, to the extent of even forty-eight glasses each day.

Stomachics and Tonics.—To prevent the undue formation of uric acid is equally as important as to get rid of it when present in the blood, and we must endeavour to effect this, if possible, by the adoption of proper measures. This object is chiefly obtained by strict attention to diet and regimen; but remedies directed to the restoration of the digestive organs are often of much importance, as we have seen that in the human subject an augmentation of uric acid is intimately associated with some forms of dyspepsia. When there is evidence of a congestive state of the liver, it must be relieved by unloading the turgid vessels; to effect this, purgatives are useful, combined with small doses of colchicum, or with minute quantities of blue pill, to produce a cholagogue action; the same can often be effected by giving taraxacum freely, and keeping up its action for a while. Small doses of the neutral salts may be advantageous, in conjunction with the last medicine, and if the patient be suffering from irritative dyspepsia, solution of potash may be given, combined with a little dilute prussic acid.

If at any time there is much want of tone in the stomach, bitters, and more especially those which are aromatic, may be either added to the other remedies or administered by themselves. For this purpose, infusions of chamomile, calumba, chiretta, quassia, or cascarilla, are indicated, with the occasional addition of small quantities of the tinctures of ginger or capsicum, to give increased stimulus to the digestive organs; such infusions may, when advisable, be combined with bicarbonate of potash, carbonate of ammonia, or bicarbonate of soda.

When treating of the use of salines, we purposely omitted the consideration of the bicarbonate of soda, as it is a salt which possesses scarcely any solvent power over urate of soda, and is, therefore, in this respect very inferior to the potash salt. Still there are cases in which bicarbonate of soda may be useful, as it agrees with the stomachs of some patients better than the potash salt, added to which it seems to influence the secretion of the liver. I prescribe it in that form of gout which occurs in full habits, when the kidneys are but little implicated, and when the diathesis is strongly connected with derangement of the chylopoetic viscera. When, on the other hand, depositions of urate of soda are taking place in and around the structures of the joints, I believe the free exhibition of salts of soda is likely to add to the mischief. In discussing the value of the Vichy treatment this subject will be again alluded to.

In connection with the treatment by tonics, it is well that we should allude to a once celebrated preparation, the Portland Powder, so named from its having been purchased by the second Duke of Portland, who, on account of the service it rendered him, distributed its recipe for general use. It consists of equal parts of the following five substances:—birthwort, gentian, germander, ground-pine, and the tops and leaves of the lesser centaury. The dose usually prescribed was a drachm, taken every morning fasting, for three months; after which it was reduced to three-quarters of a drachm, for another three months; then to half a drachm, for the remainder of the year; after this the same dose every other morning for the next twelve months, by which time it was presumed a cure would be accomplished.

It must not, however, be supposed that this mode of combating the symptoms of chronic gout was by any means novel, for we find that very similar means were adopted by the ancients; thus Aetius, Galen, and others were in the habit of employing bitters nearly akin to those composing the Portland powder, and Cælius Aurelianus even suspected they might do mischief. Sydenham likewise advises similar remedies, and gives a long list of plants which may be employed, including among them angelica, elecampane, rue, chamomile, and juniper; many of them in their nature not unlike those above enumerated.

Heberden remarks that this powder rose into favour too fast and too high to keep its place, but he thought that it had sunk into a state of discredit and neglect as much below its real merit as the first praises were above it. He was inclined to attribute this neglect partly to the largeness of its dose, which although almost too much for any body, was indiscriminately given to all, and, partly, to its having all the natural ill-effects of the gout attributed to it, particularly paralysis and apoplexy, symptoms probably due to the disease itself. Heberden states that during the great vogue of this medicine, fits of gout were so frequently lessened or found to miss their usual time of return, that few could have any doubt —he himself had none—of the powder having produced these effects; while its having any share in the mischief imputed to it is devoid of certain proof, and, in his opinion, of much probability; he further remarks, "Nor indeed was its disgrace owing to its doing too little, but to its doing too much. The dread of being cured of the gout was, and is still, much greater than the dread of having it; and the world seems agreed patiently to submit to this tyrant, lest a worse should come in its room." Heberden considered that not less than fifteen grains should be given twice a-day, in peppermint-water, and that few would bear more than a two-scruple dose for a continuance.

The use of the Portland powder has been thought by some physicians to lead to much mischief; Cullen states that in every instance in which he had known it to be administered for the prescribed length of time, the persons who had taken it were afterwards free from inflammation of the joints, but were affected with many symptoms of the atonic form of gout, and all, soon after finishing their course of the medicine, were attacked with apoplexy, asthma, or dropsy, which proved fatal.

Dr. Cadogan likewise severely censured the use of the Portland powder, remarking that between fifty and sixty people with whom he had been acquainted, and who had been apparently cured by it, in less than six years had all died; but Dr. Mason Good, in commenting upon the opinion that bitters are mischievous for gouty subjects, makes the following very judicious remark: "As Dr. Cullen gives us no account of any mischief which has followed the use of bitter tonics in constitutions marked by general debility and atonic gout, the evils he has described seem on his own evidence to be limited to those whom we have already cautioned against the employment of such a course. No proper classification or line of distinction seems to have been drawn or adhered to, which would probably have presented us with very different results if it had been, and have superseded the clashing and unsatisfactory explanation of atonic effects uniformly produced by a continuance of tonic medicines."

I cannot conceive that the exhibition of aromatic bitters in properly selected cases can lead to the evil consequences alluded to by Cullen and Cadogan, but at the same time I think that caution should be used in administering them.]

The more potent tonics—those which act on the nervous system, especially the preparations of bark—have had their advocates in the treatment of chronic gout. Bark has been extravagantly lauded by some as a curative agent, but others have altogether condemned its employment.

In relation to the action of bark and quinine, there is a point of considerable interest, in the fact that quinine has been stated by Dr. Ranke, of Munich, to diminish the secretion of uric acid by the kidneys; if this be the case, it must depend either upon its lessening the formation of this acid in the system, or checking its excretion; if the latter be true, we should expect to find quinine and bark injurious in gouty cases, but if the former be the explanation, these drugs should prove of essential service. I have repeated Dr. Ranke's observations, but my results were not altogether in accordance with those obtained by him. There was, however, some difference in the mode of administering the sulphate of quinine; he gave only one large dose, about fifteen grains; I administered the salt in divided doses.

In one patient, a young man, recovering from a slight attack of colic, the amounts of uric acid eliminated by the kidneys under the full diet of the hospital and without medicine, during four days, were 5·04 grains, 7·44 grains, 6·86 grains, and 9·22 grains. Three seven-grain doses of sulphate of quinine were then administered, and only 4·10 grains of uric acid were eliminated on that day; and on the following four days 7·68 grains, 7·70 grains, 6·53 grains, and 6·50 grains were secreted. For the next two days, six grains of the quinine salt were given three times each day, and the amounts of uric acid were 8·64 grains and 5·24 grains, and for the following three days, 5·85 grains, 6·84 grains, and 6·20 grains. It was only, then, on the first day, that any sensible diminution in the secretion of uric acid occurred; if the average quantity passed with and without the quinine be estimated, the figures will not be found to differ widely from each other.

In another case, a patient without medicine was passing 6·03 grains and 5·23 grains of uric acid on two consecutive days. When taking 18 grains of sulphate of quinine in divided doses during three days, he threw out 5·58 grains, 5·76 grains, and 4·76 grains, and the next two days without the drug, 5·59 grains, and 6·69 of uric acid. The average without medicine being 5·89 grains, and when quinine was taken, 5·37 grains.

Dr. Ranke's skill as a physiologist is so well established, and his experiments so decisive, that I should not wish for a moment to cast a doubt upon their accuracy, but would rather wait the result of further observation before forming an opinion on the subject. I cannot, however, help thinking that the decrease which occurs on the administration of the medicine is due rather to a sudden impression upon the nervous system causing the quinine to influence the excretion of uric acid, than to any deficient formation of this principle.

I have long been in the habit of giving quinine rubbed up either with the bicarbonate or citrate of potash, in cases both of acute and chronic gout, and I have no hesitation in saying, that the results obtained from the combination have been most successful: if febrile disturbance is present, it usually diminishes the temperature of the body, and it not unfrequently checks the disposition of the disease to linger about and shift from joint to joint. The dose of the sulphate of quinine may vary from 2½ to

5 grains, and it can be suspended by the use of the compound tragacanth powder. When necessary a little colchicum or iodide of potassium may be added to the quinine draught.

The last tonics we shall refer to are the ferruginous salts.

These preparations when indiscriminately given to gouty subjects are apt to excite paroxysms of their disorder, and are for the most part contra-indicated; but cases occasionally present themselves, accompanied with want of tone and an anæmic state of habit, in which their careful exhibition is attended with advantage. When iron is needed, those preparations should be selected which produce the least possible disturbance of the stomach. Cullen preferred the rust or oxide; those which I have found most beneficial are reduced iron, and the carbonate of iron dissolved in water by an excess of carbonic acid. The citrate of iron, combined with some saline, is likewise useful. Mineral waters of the ferruginous class, as those of Schwalbach, Spa, Pyrmont and St. Moritz, may also be beneficially employed, as the large amount of water tends to keep the secretions free. It is important that great attention should be paid to the condition of the bowels and liver during the exhibition of iron preparations.

I have met with a few cases of very atonic gout in subjects whose vital powers were greatly depressed, in which much benefit has been obtained from the use of the sulphate of iron, in from 1 to 3 grain doses, dissolved in water and kept in solution with a small quantity of dilute sulphuric acid; the iron has given tone both to the nervous and vascular systems, and has enabled the patient to throw off the attack. As a rule such treatment should not be persevered in for any length of time.

Treatment of Gout when accompanied with Albuminuria.—We have had occasion to notice the frequent occurrence of a small amount of albumen in the urine of patients suffering from gout, in the earlier part of this work, and this fact should not be lost sight of in treatment, as we are often enabled, from attending to the state of the kidneys, not only to afford great relief, but sometimes to render a disease tractable which would otherwise prove unmanageable. Counter-irritation to the loins is a remedial measure I frequently have recourse to in such cases: for this purpose I commonly advise either the application of mustard poultices across the loins, or a stimulating liniment sprinkled on impermeable cloth. Now and then I prescribe a hydragogue composed of bitartrate of potash and jalap, which relieves the congested state of the kidneys by causing a copious flow of fluids from the canal. It is also important in these cases to keep up the action of the skin by vapour or hot air baths.

I have records of many cases in which this treatment has proved most valuable, but will select only one for illustration.

July, 1861.—The patient is a man aged 32 years, a master plumber and painter; he inherits gout from his father, and has two brothers suffering from the same disease, all of them painters by trade.

Some years since he suffered from three or four attacks of lead colic.

About six years since he first experienced gout in one knee, soon afterwards a second fit in both ankles and one knee; the attacks have latterly become so frequent that he has scarcely had a month's interval. One peculiarity of this case consists in the fact of the great toe never having been implicated; and another feature is the readiness with which the patient was affected by mercury. During the last two or three years the upper extremities have been affected, and although there is no marked stiffening or distortion of any joint, still there are deposits of urate of soda in the helix of each ear.

The urine is copious, clear, specific gravity 1013, and contains a notable quantity of albumen.

This patient was ordered to apply mustard poultices over the loins on alternate nights, or as frequently as he could bear them; he had likewise a saline prescribed, and the result of this very simple treatment was that up to the present time, June, 1862, he has remained free from any attack; this freedom cannot be ascribed to any change of diet, for the patient had for a long time given up the use of alcohol in any shape. I have no hesitation in ascribing the great improvement to the influence of the counter-irritation upon the kidneys.

I have seen the use of the vapour and hot-air bath in some cases of gout give extreme relief when the disease was accompanied with slight albuminuria.

In connection with this subject I may mention the somewhat curious fact, that, in certain cases, gin which usually has little influence in exciting gouty paroxysms, will occasionally do so when there is much renal complication; this probably depends on the juniper oil or turpentine contained in the gin, which causes irritation of the kidneys and increases the congestion of those organs.

Local Treatment in chronic Gout.—We have already shown that chronic gout is not unfrequently attended with much local mischief, and to such an extent does this sometimes proceed, that life may be rendered completely miserable. It is stated that, in the case of the Emperor Galba, his hands and feet were so much distorted that he could neither wear a shoe, nor even hold a small book; and he is reported to have said, "When I stand in need of eating I have no hands; when walking is necessary I have no feet; but when I am to be tormented, then feet and hands are all ready."

It has long been a prevalent opinion, not only among physicians, but the public also, that when chalky deposits appear on the surface of the body, or when a case is such as to be classed under the head of chalky gout, no cure can be expected. Hippocrates and Aretæus entertained this view, and Ovid has recorded the same in his epistle from Pontus, in which he says,—

Tollere nodosam nescit medicina podagram.

And in proof that even at no very distant period the same opinion was held, we find Horace Walpole, himself a sufferer, saying in one of his letters: "I have so good an opinion of the gout, that when I am told of an infallible cure, I laugh the proposal to scorn, and declare I do not desire to be cured. I am serious; and though I do not believe there is any cure for that distemper, I should say the same if there were one, and for this reason; I believe the gout a remedy, not a disease, and being so, no wonder there is no medicine for it—nor do I desire to be cured of a remedy."

Treatment of the œdema when persistent.—One of the more common and slighter sequelæ of gout, if the inflammation has lingered for any length of time, is an œdematous state of the limb, and this is more especially seen in the lower extremities, and probably proceeds from the vessels having been weakened; occasionally, however, this condition is either dependent on or at least increased by some defect in the secreting power of the kidneys.

The œdema, if dependent on local debility, is best remedied by the use of elastic stockings, combined with gentle friction with some slightly stimulating application, as camphorated oil; at the same time the limb should be elevated as much as possible on a foot-rest, to facilitate the free return of blood by the veins. If the kidneys be in fault, a condition generally indicated by the presence of a trace of albumen in the urine, other remedies may be required, and the vapour or hot-air bath, saline diaphoretics, with gentle counter-irritation to the lumbar region, are of great service. For several years Hume adopted a plan of treatment of this form of œdema, when not connected with renal disease, which has proved most successful; it is as follows:—Each morning, before dressing, the feet and ankles are douched for about three or four minutes with hot water of as high a temperature as the hands can bear; this is poured from a water-can held up as high as convenient; immediately afterwards the parts are bathed with a cold strong solution of common salt, a sponge, soaked in this fluid, being repeatedly dabbed upon them. The hot douche reddens the skin and gives activity to the circulation of blood in the parts, the subsequent sponging with cold salt water braces up the vessels in a remarkable degree. When the douche is not practicable, I substitute for it simple immersion of the feet and ankles in the hot water for the same length of time, and then have the cold salt sponging as before. The knees can, if necessary, be treated in the same manner, as likewise the hands.

Treatment of chalk stones and stiff joints.—As the physician is often consulted by patients suffering from the consequences of chronic gout, including not only chalk stones and abscesses, but also stiffness of the joints, I will try to explain the best mode of dealing with these forms of local mischief. Sydenham was of opinion that, under the influence of daily and long-continued bodily exercise, not only were tophi prevented from forming, but even indurated tumours of considerable standing occasionally disappeared; at the same time he remarks that this only ensued in cases where the chalky tumours had not converted the skin into a substance like themselves.

Boërhaave has an aphorism to the effect that good may be done by proper treatment, even in the tophaceous variety of gout; and others have entertained still more sanguine expectations from remedies.

False ideas of the composition of gouty concretions led at one time to the use of acid lotions, and a mixture of hydrochloric acid and oil of turpentine was occasionally employed.

Alkaline remedies, however, gained most favour, notwithstanding that an explanation of their value was not reconcileable with the idea of chalk-stones being of the same composition as bone earth, and we find Aëtius making use of a compound of quicklime and nitre (probably an alkaline carbonate) mixed with lard. Trallianus also employed a similar compound, and Van Swieten made a composition by heating together crude tartar and quicklime, a solution of which in water he applied to the gouty tumours, and asserted that it was followed by remarkably good effects, and sometimes in the course of a few days by the total dispersion of the swelling.

Scudamore, from considering the easy solubility of uric acid in a solution of potash, was led to the employment of the latter as an external application, and remarks that, in three instances of recent deposit, it was so successful that the concretions which had been visible under the skin were gradually removed; he ordered the solution of potash to be mixed with at least an equal quantity of recently-prepared almond milk, and rubbed on the part two or three times a-day.

When chalk-stones were of long standing, he considered that, although much less could be accomplished, still the case should not be abandoned, and he thought that even then the alkaline liniment might diminish the size of the tumours and increase the mobility of the joints.

If stiffness of any joint be left as the result of a gouty fit—and we have seen that even partial anchylosis may be caused by a single attack—then recourse must be had to local treatment, consisting in the use of friction and passive movement, but short of inducing tenderness of the joint. The friction may be effected with some simple lubricating embrocation, made more or less irritating by means of ammonia or an essential oil; occasionally, under these circumstances, small blisters are productive of much advantage.

In using mechanical appliances for joints stiffened by gout, the cause of such rigidity should never be lost sight of, for injury may be induced by a too harsh mode of procedure; gentle means, continued over a lengthened period, are most likely to be attended with success. In such cases the use of mineral baths, as those of Aix-la-Chapelle, Aix-les-Bains, Wiesbaden, Teplitz, and Buxton, is often of considerable benefit, and douche baths and shampooing are specially indicated.

It must be borne in mind that the stiffness and tenderness of the joints is generally dependent on two combined causes, partly on the formation of deposits of urate of soda in the ligaments, and partly on a chronic form of inflammation closely resembling ordinary inflammation, which is kept up by the presence of the foreign matter; the latter condition is capable of relief by the aid of counter-irritants and friction, combined with the internal use of iodide of potassium; the former is difficult to remove, but the long-continued use of some solution has, as we shall show, considerable power in effecting this object, especially if aided by the employment of properly selected internal remedies.

When chalk-stones appear on the surface the question of the possibility of their removal by treatment is often mooted, and the following is a summary of what may be done in such cases.

When the ears of gouty patients, exhibiting the pearl-like nodules upon the helix or antihelix, are watched, it will frequently be found that in the course of a few months a considerable change takes place, arising from the falling off of old and the formation of new deposits, and this change is sometimes caused by the unintentional picking or rubbing of the ears. These concretions, it will be remembered, are produced by a liquid exudation into the fibro-cartilage, which afterwards hardens, and, the integument covering the cartilage being thin, is easily penetrated, the nodule detached, and a natural cure thus effected. The ear, for example, represented in Plate I., fig. 1, b, had undergone many changes during the time the patient was under my own observation. If it be desirable on account of the size of any such deposit to remove it speedily from the ear, this can be accomplished, if it be semifluid, by puncturing with a lancet, and squeezing out the crystalline matter by the aid of slight pressure; if the concretion is older, it can be detached in little hardened masses consisting of aggregated crystals. On account of the little susceptibility of the ear to take on inflammatory action, such treatment is not followed by any injurious consequences. Now and then small tophi may be separated in the same manner from other parts, but in doing this we should be careful to ascertain if they possess a deep origin, as this circumstance greatly influences the facility of the after-healing.

When concretions are formed around joints, and project so as to be of much inconvenience, producing tumours more or less resembling those delineated in fig. 2, and fig. 3, it may occasionally be prudent to puncture them with the lancet, taking care to make small incisions, and not to use much subsequent pressure in removing the creamy matter. Such incisions will often heal by the first intention; if not, the part may be kept moist with water-dressing or a bread poultice, and then after a short time allowed to heal.

Occasionally, when incisions have been made, and more frequently when the tumours have burst of themselves, the sores become troublesome, and remain open for a long time. This obstinacy arises from the deposit being deep-seated, and from its continuing to approach the surface in order to be discharged; besides this, when air has been once admitted, the formation of pus generally ensues, which adds to the difficulty of healing. Under these circumstances the application of nitrate of silver or of some one of the resinous ointments is of use to restore healthy action.

Mr. James Moore, in his communication to the Medico-Chirurgical Society, recommends that, when a severe fit of gout attacks a part in which there is an accumulation of chalky matter, a warm poultice should be applied and if there be any threatening of gangrene, which I may observe very seldom happens, he advises stimulants and opium to be administered. If the cutis over a deposit opens, but leaves the chalky matter confined by the cuticle, he thinks that a puncture should immediately be made, but that it is imprudent to touch the skin itself with the lancet, or even to make a large opening into the cuticle. He is also opposed to the use of much pressure for the purpose of squeezing out the gouty matter, and says that even a small puncture will permit a portion of the fluid to escape, and that more will run out into the poultice, and thus the tumour is removed, and the symptoms commonly improve. When the inflammation has subsided, stronger means are allowable: some portion of the cuticle may be removed to facilitate the discharge, and gentle pressure may be also employed. If an ulcer has much chalky substance at the bottom, no attempt should be made to get rid of this by the knife, as it may cause gout, or set up inflammation, and, as the deposited matter is in separate cells, an incision would remove but little of it. Caustic, employed with caution, answers better, for, by destroying the cellular membrane that confines the urate of soda, it often enables it to escape. Mild dressings only should be applied, as all stimulants are hurtful. It should be borne in mind, in order to prevent disappointment, that these ulcers are often of long duration; this can be readily understood when it is remembered that not unfrequently the deposit of urate of soda extends from the surface down to the joint itself, a fact readily seen on reference to the drawings in Plate III., figs. 1 and 2.

Within the last twelve years I have been led to the employment of lithia as an external agent. At first I used a weak solution of carbonate of potash and thought some benefit was often obtained from the application; I have however seen much more decided results from the use of a solution of lithia. In one of my earlier trials the solution was applied to the end of the index finger of a gentleman upon which there was a concretion about the size of a pea, which prevented the glove from fitting at all properly. The solution contained five grains of carbonate of lithia dissolved in a fluid ounce of rose-water; a piece of lint was soaked in it, and wound round the end of the finger, this was covered with a shield of thin gutta-percha. After a week or ten days, the little concretion, which was originally hard, became pasty in consistence; then more soft, and within the month it was almost entirely absorbed, and at last it disappeared.

I afterwards tried to cause the absorption of larger tumours; in one case a concretion on the great toe of a patient in the Hospital, of the size of a small egg was subjected to the same treatment, and the result was that in the course of six weeks it was reduced to half the size. In many other instances patients have assured me that a similar treatment has caused the deposits to disappear.

I have lately been in the habit of applying the same lotion to the phalangeal joints of fingers which have become stiffened by an attack of gout, and the good effects have generally been most marked, the joint becoming reduced in size and capable of being flexed and extended; of course the sooner such treatment is adopted after the stiffening has occurred, the more effectual it usually is. Now and then I add to the solution the same quantity of iodide of potassium as of carbonate of lithia, with the view of removing the ordinary thickening of the tissues which so frequently arises from inflammation.

In concluding our remarks upon the local treatment of gouty chalk-stones, I may add, that it is a judicious rule to interfere with them as little as possible by surgical means, as small advantage can be obtained, and great mischief may be produced; in illustration of which I may mention that I was once consulted as to the propriety of removing a chalk-stone of considerable size from the back of the hand of a gouty patient; I found that the deposit evidently extended deep into the tendinous structures, and strongly advised that no operation should be performed; however, the wish of the patient was strongly in favour of its removal, and after a time it was taken away by the knife. The result was fatal, for gangrenous erysipelas set in, and in a few days carried off the patient.

Diet and Regimen in chronic Gout.—Of the importance of a regulated diet and attention to regimen in the cure of chronic gout, in order to prevent the returns of the disorder, there can be but one opinion, and all experience and authority are in its favour. Galen affirmed that it was impossible to cure those who over-indulge themselves in eating or drinking, as by their intemperate way of life they are constantly adding to their disease, and Sydenham wisely said, that however valuable remedies were in chronic gout, they were insufficient single-handed, and need be accompanied with great care in diet; in alluding more particularly to his own case, he remarked that moderation in eating and drinking must be strictly attended to, in order that the stomach may receive no more food than it can easily digest, and no fresh fuel be thereby added to the disease. Sydenham at the same time considered that the opposite extreme was equally injurious, as he had experienced in his own person; for abstinence, says he, weakens the parts, by withholding from them their due proportion of that aliment which is necessary for supporting their vigour and strength. Cullen, although doubting the power of medicines, thought that much might be done by proper attention to regimen, feeling fully persuaded that any man who commenced in early life a constant habit of bodily labour and abstinence from animal food, would be preserved from gout, even if he inherited it.

In chronic gout the rigid diet, so necessary in the acute paroxysms, must be replaced by one capable of supporting the strength of the patient; but as all nutriment which exceeds this is productive of injury, there is no little difficulty in correctly apportioning the food. In respect to this point no better rule can be laid down for the gouty subject than that of Sir William Temple, who recommends, "Simple diet, limited by every man's experience to his own easy digestion, and thereby proportioning as near as can be the daily repairs to the daily decays of our wasting system."

As the exacerbations of gout abate, the diet may be gradually improved; some of the farinaceous matter may be replaced by fruit, fish, or fowl, and afterwards by meat; it is of much consequence to avoid all indigestible dishes, and especially such as contain free acids, as these are apt to cause a recurrence of the paroxysm. The use of an exclusively vegetable diet has occasionally been recommended in the treatment of gout, and cures have been related in which, by its employment alone, patients were not only kept free from inflammatory symptoms, but their chalk-stones were also removed; a return to an animal diet is said to have been immediately followed by an accession of the disorder. Experience has clearly shown that gout cannot be successfully treated by abstinence from meat, although a careful restriction, so that the quantity should not exceed that which is necessary for the proper sustenance of the body, is of much importance. Examples are not wanting of gouty persons having entirely regained their health by being reduced to poverty, and obliged by daily labour to gain a spare sustenance; and Cornaro is said to have freed himself from gout and to have lived to be a centenarian simply by careful dieting, although he did not commence his change of living until he was more than forty years old. Such a sudden change, although occasionally successful, would, in many instances, bring on a paroxysm of the disease, and not unfrequently be dangerous.

One of the best methods of limiting the quantity of animal food is to make the number of dishes few, as mixtures of different meats are not only more difficult of digestion than an equal quantity of one sort, but the appetite, when tempted, often desires more than the stomach is capable of properly digesting.

The most digestible meats, as mutton, well kept beef, and poultry, with the white kinds of fish, as codfish, sole, and whiting, may be partaken of; salmon, although usually forbidden, is often innocuous when eaten simply with a little salt and cayenne. Veal and pork should be avoided, as well as salted meats, cheese, and raw vegetables, likewise highly seasoned dishes and rich sauces, as they are likely to induce dyspepsia.

Potatoes, valuable in giving constituents to the blood which are essential to its healthy composition, as likewise boiled greens, turnips and carrots, may be eaten sparingly.

All stone fruits, apples and pears, unless baked, should be ignored, but strawberries in small quantities, grapes, oranges, and other succulent fruits may be enjoyed in moderation. Strawberries were even stated by Linnæus to prevent the occurrence of gouty attacks when habitually taken, but they often disturb the stomach. Sub-acid fruits owe their efficacy to the alkaline salts they contain, which are decomposed in the blood, and appear in the urine chiefly in the form of carbonate of potash, and thus stimulate the kidneys to increased action.

Not only the character of the diet, but the time of taking food must be regulated; it is desirable, if possible, that the gouty man should dine in the middle of the day, or not later than three or four o'clock; brown meat should be taken at that time only, except when circumstances render its more frequent exhibition advisable, and late suppers should be avoided. In restricting animal food, I would not forbid an egg at breakfast, when it agrees with the stomach, or a small rasher of broiled bacon, if care be taken to avoid the lean portion, which is of difficult digestion on account of its hardened fibre.

Some gouty people find it better to partake of a good breakfast and a moderately late and light dinner, only taking a biscuit or bread and butter and the like in the middle of the day. It will be found in practice that different stomachs require a somewhat varied treatment as far as the frequency and time of meals are concerned.

The stronger wines and malt liquors must not be allowed; if alcohol in any form be requisite, a little weak brandy, whisky, or unsweetened gin may be taken, freely diluted; it is sometimes necessary to make an exception, as from long habit some other stimulus may be essential to the proper performance of digestion; in such instances, a little sound sherry, as Amontillado, or Manzanilla, is best. Port wine should be absolutely forbidden, and as a rule Sherry, Madeira, and Moselle, should be altogether eschewed, as they contain a considerable amount of unfermented matter, and are liable even to induce gout in those not inheriting the disease. Champagne and other sparkling wines may be classed in the same category.

The best wines are sound red Bordeaux (claret), light Hock and still Moselle: these wines are as a rule thoroughly fermented, containing therefore no saccharine matter; they are at the same time rich in acidulous salts, as cream of tartar, but if sound contain no free acid. It is of the greatest moment in all cases that the patient should observe extreme moderation; one or two glasses of wine taken with the principal meal are generally sufficient, but the amount cannot always be specified, and must necessarily depend, not only on former habits of life, but also upon the age and strength of the patient, and other constitutional peculiarities.

Sydenham, in alluding to the stronger wines, says that at least the first part of the old saw is true, "If you drink wine you have the gout, if you do not drink wine the gout will have you."

The objections to the use of malt liquors, as ale, beer, and porter, are as strong as, if not stronger than those which are urged against wine. I have known several patients in whom the attacks were much prolonged by their partaking of such beverages; and not only does it lengthen the paroxysms of chronic gout, but it gives a great tendency to their return. I remember a gentleman who was experiencing attacks every six or eight weeks, who, simply by avoiding pale ale, kept them off for more than a year, and some of the most chronic and inveterate cases I have ever met with have been in persons who had brought on the disease solely by the use of strong malt liquors. It is by no means unusual to find such instances among the men connected with large breweries. When in the least degree hard or acid, malt liquors act powerfully in exciting the gouty paroxysm.

Milk has been especially recommended for the gouty, and it might naturally be supposed that, from its nutritive powers and unirritating nature, it would prove beneficial. It appears that in many cases a milk diet has been of much service, especially in the young and strong, but in some instances it has entirely failed, and in old people its adoption may do harm. Sydenham remarks with regard to a milk diet that "It has done good as long as it has been rigidly attended to; the moment, however, that the patient swerves from it a hair's breadth, and the moment he betakes himself to the diet of a healthy man (no matter how mild and simple), the gout returns worse than ever."

Of tea and coffee in gouty cases little need be said, they should be taken in moderation and not too strong; if they cause indigestion, as is sometimes the case, cocoa may be substituted for them. It has been suggested that coffee may possess the power of preventing gout, seeing that in countries where it is extensively drunk, as in Turkey, gout is scarcely known; but it must be remembered that, in such countries, little wine or malt liquors are taken, and this fact would satisfactorily explain the exemption from the disease. The same may be said of tea, and of the exemption from gout attributed to the Chinese.

Exercise is most important in gout, as inactivity tends powerfully to engender a state of system leading to its renewal; in the chronic form it is of great moment, and likewise in the intervals between the attacks. Sydenham's opinion of exercise is frequently expressed in his treatise, and in one passage he says, "Moreover, much as the pain and the great inaptitude for motion may seem to contra-indicate that remedy which I have so much extolled—exercise—it must still be undergone; since, although at the beginning of a fit it may appear impossible for the patient even to be carried to his carriage, much less to bear the motion of it, he will nevertheless, provided he make the attempt, in a short time feel as little pain when driven about in his coach, as when seated in his elbow-chair at home." And again, in respect to the kind of exercise, riding on horseback, unless forbidden either by old age or a calculus, is by far the best. Indeed I have often thought within myself, that if any person knew a remedy of which he wished to make a secret, equally efficacious in gout as regular and steady riding on horseback, he might make a fortune."

For exercise to be useful in gout it should be moderate and regular; if excessive at any one time, it may produce injury, and, if not regular, or if its effects on the system be not kept up, it is of little value. Foot and horse exercise are both good, carriage exercise less so, but still of much advantage when the others cannot be taken. Friction may occasionally be substituted for exercise when the latter cannot be taken to a sufficient extent. Sir William Temple remarked, that no one need have gout who could afford a slave to rub him; without going to this length, it is certain that no inconsiderable advantage may be thus obtained.

In all cases the amount of exercise must be carefully apportioned to the age and strength of the patient; although exercise has been occasionally advised and even practised at the commencement of a gouty fit, as in the case related by Van Swieten of a dancing master, who, having suffered twenty years from gout, kept his joints free from stiffness by getting out of bed and walking about as much as he could the moment he perceived the least remission of pain, and continued this every day, still the practice is not unattended with danger, and cannot be recommended; besides which few patients can be found who have the moral courage to pursue it.

Fresh air is highly valuable, especially to those of weak habit; sometimes, when all other remedial and dietetic means have failed, fresh air has effected the desired object. A bracing air, such as is obtained in elevated localities, is peculiarly advantageous to many such subjects, and probably part of the benefit derived from a sojourn at mineral springs thus situated is due to this cause.

In certain cases, where the attacks are peculiarly dependent on the state of the skin and readily excited by the bleak east and north-east winds, change to a warmer climate becomes desirable, and the intervals of the fits may often by these means be greatly lengthened. Instances, indeed, have been known in which a complete change of residence to a warmer locality has altogether prevented the returns of gout, and from my own experience I feel assured that this step is often most beneficial. Although gout is not very prevalent among Europeans in India, still the influence of a change of climate will by no means permit immoderate indulgence, and in proof of this it will be found that gout is somewhat common in our own army in the East.

Egypt, Algeria, and Malta are favourable places for residence during the winter and early spring; some parts of Southern Europe, as Gibraltar and Malaga, are also well fitted for gouty patients; but the selection of the locality must depend much on the peculiarities of the case, as a climate found beneficial to one person may occasionally be productive of deleterious results in another; a circumstance easily explained by the facts before advanced concerning the nature and causes of the disorder. Exercise, fresh air, and change of climate produce their beneficial effects by giving tone to the stomach and digestive process, by increasing the functions of the different secreting organs, and at the same time by imparting strength both to the nervous and muscular systems.

The cutaneous function must not be neglected either during the attacks or in the intervals of chronic gout; the clothing should be sufficiently warm to protect the surface, and especially the feet, from being chilled, to effect which flannel should be worn next the skin, and the stockings should be of wool, but any undue warmth or overheating of the body must be carefully guarded against. The action of the skin may at times be advantageously excited by warm baths, by sponging the body with tepid water, or still better, with salt or sea water, followed by friction with a coarse towel. Some patients are much benefited by the occasional or even frequent use of the Turkish bath; it must not, however, be looked upon as necessarily a curative or preventive means, for I have known patients experience severe attacks of gout although taking a Turkish bath almost every day. As long as its use is not attended by debility or a feeling of languor, it proves itself a useful adjunct to other modes of treatment, especially in subjects whose skin function is usually deficient. The importance of a proper attention to the skin will be at once evident, when we reflect that it is by means of this surface that much acid matter is constantly excreted, and that when the cutaneous function is suppressed the blood becomes less alkaline, and a fit of gout may be thereby occasioned: for this reason cold often acts as an exciting cause of gout, and warmth tends to ward off the disease.

Lastly, the influence of the mind on the development of gout must not be lost sight of. Any mental disturbance tending to depress the nervous system is certain to be followed by injurious consequences to gouty subjects, and it is therefore of great moment in the treatment of gout, that all such influences should be carefully avoided, and the tranquillity of the mind as much as possible ensured. For this purpose late hours should be shunned, study and the cares of business laid aside, and the mind employed with pleasant thoughts and occupations. The fact that prolonged mental exertion of any kind powerfully affects both the assimilating and digestive functions is well established, and that such must necessarily exert a baneful influence on the progress of gouty affections is equally certain. Sudden and violent emotions have occasionally been followed by an instantaneous relief of the paroxysm, but they are likewise apt to prove dangerous and should be carefully guarded against. In illustration of the effect occasionally produced by violent mental emotion, I may instance the case of a man once under my care, who, when suffering severely from a third attack of gout, had a quarrel, leading to blows; the intense effort appeared to cause the rapid subsidence of the gouty inflammation, and the patient afterwards remained free from the disease for several years.

In concluding my remarks on the management of chronic gout it may be desirable to give a brief summary of the principal indications necessary to be fulfilled.

First, to treat the chronic inflammation of the joints by means less heroic than those employed in the acute disorder.

Secondly, to render the blood pure by stimulating the various secreting organs, more especially the kidneys and skin.

Thirdly, to restore the power of the stomach, which is usually much impaired in chronic gout.

Fourthly, to treat the local mischief which long-continued inflammation is certain to produce in the articular structures.

Lastly, to regulate carefully the diet, and in every possible way, by air and exercise and other regimenal means, to keep up the tone of the system.

CHAPTER XIII.

TREATMENT OF GOUT:—MINERAL WATERS—GENERAL REMARKS ON THEIR EMPLOYMENT—ALKALINE WATERS OF VICHY—MODE OF ACTION OF—AUTHOR'S EXPERIENCE OF THEIR VALUE—SALINE WATERS OF WIESBADEN—THEIR VALUE IN GOUT—LITHIA SPRINGS OF BADEN-BADEN USED IN GOUTY CASES—VALUE OF THE WATERS OF CARLSBAD, HOMBURG, WILDBAD, TEPLITZ, BUXTON, AIX-LA-CHAPELLE, AIX-LES-BAINS, ETC.—SUMMARY OF THE TREATMENT OF GOUT BY MINERAL WATERS.

FROM the opinion expressed in the preceding pages as to the efficacy of dilute saline solutions in the treatment of chronic gout, it will be no matter of surprise that the subject of mineral waters should be next discussed. The reputation which many of these waters have acquired, shown by the large number of patients who annually resort to the different springs, will sufficiently justify our devoting some short space to the consideration of some of the most important of them.

All mineral waters possess one action in common, derived from the influence of the water itself, and it is a well established fact that this agent, when absorbed in large quantities, powerfully stimulates the processes of the animal economy and increases the various secretions. In less important respects mineral waters differ considerably from each other; those which contain iron augment the blood corpuscles and restore the impoverished blood of anæmia; those rich in sulphur, in the form of sulphides, have their action especially directed to the skin and mucous membranes; when sulphates of soda and magnesia are the preponderating ingredients, the intestinal canal is peculiarly influenced and purging results; lastly, when the alkaline carbonates form the principal constituents, the reaction of the secretions becomes sensibly affected, and the composition of the blood materially altered.

The mineral waters employed in the treatment of gout differ very considerably from one another; some owe their therapeutic value to the nature of their saline ingredients; others may be looked upon as chemically almost inert, except from the water in their composition; many of these waters owe part of their efficacy to elevated temperature, as also to the presence of sulphur in a greater or less degree.

We shall divide them into three classes, the first including the springs of Vichy, Wiesbaden, Homburg, and Carlsbad; the second, those of Wildbad, Teplitz, Gastein, Pfeffers and Ragatz, Buxton and Bath; while the third owes its special efficacy to sulphur, and includes Aix-la-Chapelle, Aix-les-Bains, Barèges, and Luchon. It may be observed that several springs of the second class are situated high above the level of the sea, and probably the pure and bracing air of these localities, the deeper inspiration which it occasions, and the stimulation of the system thereby induced, may conduce much to the cure of patients who resort thither.

Mineral springs of Vichy (*France*).—As Vichy is much resorted to, not only by gouty invalids from France and many other parts of the Continent, but from England also, and as the waters are imported into this country and artificially prepared here, it is a matter of importance that we should investigate their value in the treatment of gout, and the cases best adapted for their administration; for it will be found that these waters are exceedingly powerful, and, when injudiciously taken, capable of producing very mischievous effects. An elaborate analysis of the waters from the many different sources of Vichy and its environs will be found in the Appendix, from which it may be gathered that they resemble each other very closely in composition; that bicarbonate of soda forms their chief ingredient, averaging about forty grains to the imperial pint; and that the other carbonates, although they augment the alkaline property of the waters, are but of secondary importance. The water from the Grande Grille and Hôpital is hot, from the other sources it is cold or nearly so.

Bicarbonate of soda, when thus administered, becomes rapidly absorbed into the blood, exalts its natural alkalinity, and, if long continued, causes a species of solution of the blood, and hence medicines of this class have been called fluidifiers, antiplastics, and deobstruents. MM. Trousseau and Pidoux, in their "Traité de Thérapeutique," assert that they have noticed ill effects result from the abuse of alkalies taken in the form both of Vichy and Carlsbad waters. Dr. Petit speaks of their neutralising the uric acid in the blood or rendering it soluble by the formation of an urate, but this is evidently an erroneous idea, for we have proved experimentally that uric acid always exists in the blood in the form of urate of soda. The presence of soda in the system in increased quantities appears to affect especially the function of the liver, which may partly be explained by the fact that the bile itself is a species of soda salt. As gout, or at least the diathesis leading to its production, is often closely connected with deranged hepatic function, improvement may often be expected from the use of these waters.

The effect of the Vichy waters on the urine can be readily observed. M. d'Arcet, who made many experiments on this subject, states that one glass, containing about fifteen grains of bicarbonate of soda, when taken in the morning, fasting, is not sufficient to render the urine alkaline, although it sensibly diminishes its acid reaction; when two glasses are taken under the same circumstances, the urine quickly becomes alkaline, but remains clear; and that passed during the subsequent eight or nine hours has the same characters, after which time it re-acquires its natural acidity; three or more glasses of Vichy water cause the urine to continue alkaline for twenty-four hours, the transparency of the fluid remaining as in health.

When the Vichy waters are employed in the form of the bath, redness and slight irritation of the skin are liable to be produced, especially if the waters be not diluted.

We have evidence that saline matters are absorbed by the skin with great facility in the fact that one bath is usually sufficient to render the urine alkaline, even without the internal exhibition of the waters; this has been stated to be the case by MM. d'Arcet, Chevallier, and Dr. Petit.

When at Vichy I made an observation confirming the truth of this statement, taking a bath for twenty minutes composed of equal parts of Vichy and ordinary water. The urine before entering the bath was strongly acid, but, on leaving it, the alkaline reaction was well marked and remained so for more than an hour. This alkalization of the urine has usually been regarded as a decided proof of the absorption of the soda salt by the skin; but it is right to mention that the same effect has been asserted to be produced by an ordinary warm bath, and this has been ascribed to the increased action of the skin, causing an augmented elimination of the natural acid secretion.

The late Dr. Parkes collected the observations of numerous experimenters on this point, and from these it would appear that very few saline substances are absorbed by the skin during the use of the bath; it seems also that there is almost invariably a very distinct lessening of the acidity of the urine from the use of the bath, even when free nitric acid is contained in it. From these observations Dr. Parkes is inclined to think that writers in general have been too ready to assume the permeability of the human skin by different saline substances. I have, however, found distinct evidence of iodine in the urine after the use of a lotion containing the compound tincture of that substance, and have also seen symptoms of iodism produced by the external use of iodine paint. The whole subject deserves much further investigation.

Various mucous membranes, especially that of the bladder, are also influenced, and the mucus from them becomes less tenacious, and often diminished in quantity. The perspiration has likewise been supposed to undergo a change in reaction; the bowels are seldom affected, unless the waters are improperly administered.

For the first few days of taking the waters few symptoms are observed, but occasionally patients complain of some weariness of the limbs, weight of the head, and a feeling not unlike slight intoxication accompanied with a desire for sleep; and sometimes there is also an increase in the disease for which the treatment has been adopted. These first symptoms are not considered of any importance, for, if the medication be continued, they often disappear and are succeeded by a feeling of increased vigour.

If, however, the same symptoms return after the treatment has been pursued for some time, their significance is much greater, as they indicate a condition of saturation of the whole system, and the waters must be at once taken less freely or discontinued, to be resumed again or not according to circumstances.

In 1840, the French Academy of Medicine caused a report to be drawn up by a commission formed to investigate the subject of Vichy waters in the treatment of gout, and in pursuance of their inquiry, many questions were asked of the late Dr. Petit, then Médecin Inspecteur at Vichy; we shall perhaps place the subject in a clear and simple light by giving a short summary of the report thus elicited.

Dr. Petit considers that the waters may be employed when a fit of gout is impending, and even when it has begun to develop itself, and he thinks that the accompanying fever, if simply dependent on the articular affection and in no way connected with any disease of the organs of the chest or abdomen, need not be regarded as a contra-indication. However, there are certain patients who are very susceptible, and in whom the tolerance for the waters diminishes or entirely ceases when an attack of acute gout affects the joints; in such cases it is right either greatly to decrease or altogether to suspend the use of the waters. On the decline of the fit it is also necessary to act with much prudence, for fear of reproducing the attack; active treatment should not be recommended too soon, and it is especially necessary to avoid the early use of the bath.

The results obtained from the waters are much more prompt, more complete, and consequently more striking, in acute than in chronic forms of gout; in the latter the intervals are short, and the treatment must be persevered in for a long time, in order to give the patient a chance of regaining the use of the joints; and even then the advantage is by no means certain. During a course of treatment in chronic cases the disease sometimes assumes an acute character, but this is not essential to the success of the cure.

Dr. Petit considers that chalk-stones are occasionally absorbed, although it is a rare occurrence; but he thinks that when patients are submitted to the Vichy treatment, and this is persevered in for a long time, new concretions are but rarely formed.

The effect of the treatment is to diminish the violence of the fit and somewhat abridge its duration, but its chief object is to combat the proximate cause of the disease and prevent its return.

Dr. Petit remarks that, as a rule, the Vichy waters agree well with the gouty, but he advises moderate doses, as for example five or six glasses each day, together with the administration of a bath. If this quantity is easily supported, the number of glasses may be increased to twelve or even fifteen. Some patients have taken as many as twenty without inconvenience, imagining that, if relief be obtained from small quantities, much more advantage will accrue from larger, and so the prescribed amount is often exceeded. Certain individuals have been known to drink thirty, forty, and fifty glasses; and it is stated that one man took as many as eighty-four glasses in the twenty-four hours.

Dr. Petit considers that the waters of Vichy owe their efficacy in gout to the fact of their containing a considerable amount of soda, and that other waters similarly constituted would have the same value. He also thinks that, as the waters contain the soda in the form of the bicarbonate, they are useful when taken at a distance from their source; but that, as a rule, they do not sit so easily on the stomach and cannot be taken in so large quantities as at the springs.

During the first and second years of treatment, full saturation of the patient is considered of advantage, and for this purpose at least a month's exhibition of the waters is necessary; considerable benefit is often obtained from prolonging the treatment even beyond that time, especially if stiffening or anchylosis of the joints is present.

Patients occasionally experience a repugnance for the waters, accompanied with want of sleep and a feeling of agitation, and sometimes this is shown at an early period of their exhibition; when it occurs the treatment must be at once discontinued.

Having thus exposed the principal views on the treatment of gout by the use of the Vichy waters which were held by Dr. Petit, a gentleman who had abundant opportunities of becoming thoroughly versed in the subject, it is only right to observe that his opinions are not generally received even by French physicians: for example, Dr. Durand Fardel, Inspector of the Sources of Hauterine near Vichy, who has also written on the subject, differs considerably from Dr. Petit on several important points; for, although he is fully of opinion that much benefit is often derived from the use of the Vichy waters in gout, and that, if they do not cure the disease, still they exert a salutary influence upon the general health as well as on the symptoms of the malady, he nevertheless considers that their exhibition demands much caution. Dr. Durand Fardel believes that Vichy waters do not cure gout by specially influencing the uric acid, but merely by producing an alterative effect. As the mineral waters act as general excitants to the whole organisation, and especially to the secreting organs, he thinks they should only be employed under certain circumstances, which may be thus briefly stated.

They should not be taken either when a fit of gout is threatened or at its commencement, or during its continuance, or after its decline, until we are fully assured that it has completely passed off.

The time most favourable for the exhibition of these waters is during complete freedom from the attacks.

There are several cases on record of gouty subjects having died suddenly soon after commencing the Vichy treatment, but these patients were suffering not only from gout but likewise from organic disease of some important organ. Sometimes the disorder appears to have been rendered more chronic, and sufficient evidence of the occurrence of ill effects has been given to make it advisable to use great caution, not only in the mode of the employment of the waters, but likewise in the selection of the cases.

Having seen cases of gout exhibiting every variety of phase, in which Vichy waters have been employed, and having witnessed the plan of treatment adopted at the baths, I feel entitled to give an opinion upon the subject. Vichy waters are undoubtedly agents which powerfully influence the whole economy and alter the character of the animal fluids, and, if they are sometimes potent for good, they are also capable of causing much evil.

With regard to their exhibition in gout, I consider them to be often injurious in chronic cases, especially when the system is already lowered, and the rapid formation of urate deposits is taking place either in the joints or upon the surface of the body; I believe that they sometimes increase these deposits and still further depress the vital powers. I also think that the constitution of Vichy waters is not such as to render them desirable in all gouty cases, inasmuch as an excess of carbonate of soda rather tends to diminish than augment the solubility of urate of soda, which is always present in the blood in these subjects. In many forms of chronic gout the baths are useful, but then their value is independent of any peculiarity in their composition.

In acute gout, Vichy water, taken in moderate quantities, either during the attack, or when a fit is impending, or in its decline, is not likely to do harm, but the use of the bath is very hazardous and should never be risked; I am confident that, when acute inflammation is present, other treatment is more appropriate.

In the complete intervals of acute gout, and more especially in strong and robust subjects, when the disease depends rather on increased formation than defective elimination of uric acid, and likewise in cases in which the liver and digestive functions are considerably at fault, the employment of these waters is likely to prove most beneficial; in other forms of gout mineral waters of a different class may be resorted to with greater advantage than those of Vichy.

Mineral springs of Wiesbaden (*Nassau*). The physical and chemical characters of the Wiesbaden waters may be represented by those of the Kochbrunnen spring, which is the one almost exclusively employed. The water of this spring possesses the following properties. The temperature is about 160° Fahr., and it emits copious vapours; in odour it somewhat resembles quick lime, and the taste is not unlike weak but highly salted chicken broth; its density is 1006·6, and it contains in the 1000 parts, 8 parts of solid matter, and 0·5 parts of gas. The detail of the analysis by M. Fresenius will be seen in the Appendix.

When the water is allowed to remain in contact with the air, as occurs in the baths, a pellicle forms on the surface, of a somewhat greasy appearance, but, in reality, it consists of carbonate of lime, which the escape of carbonic acid has rendered insoluble, and no appreciable amount of organic matter is present in it.

It will be evident from the consideration of the nature of Wiesbaden water, that the effects produced by it upon the economy are due, in part to the exhibition of water at a high temperature, in part to the saline matters contained in it, and more especially to the chloride of sodium. The lime salts, as the carbonate and sulphate, probably possess some influence, as also the free carbonic acid and the small amount of iron, but these, as well as the remaining ingredients, play a very secondary part compared with that exerted by the common salt.

The physiological effects usually produced by these waters when taken in small doses are, some increase of the saliva and buccal mucus, giving rise to frequent deglutition and acuteness of the taste; a feeling of warmth in the epigastrium, accompanied with eructation of carbonic acid gas; along with these symptoms there is usually an increase of appetite, and improvement in the digestive functions. After the absorption of the water into the system, the most appreciable effect is an augmentation of the urinary secretion; the bowels are usually not affected by the water unless it be taken cold, when it sometimes produces a slight aperient action; on the other hand, if the patient drinks it very hot, constipation may be induced.

If the water be administered in larger doses, all the above symptoms become more marked, and unless the skin and kidneys act very freely, slight diarrhœa is apt to occur, with stools rich in the biliary constituents and other secretions from the intestinal tube.

These large doses if continued for several weeks, generally give rise to a diminution in the weight of the body, and this is more especially seen in the decrease of abdominal fulness; cutaneous eruptions, especially acne, are often developed, and should the waters be persevered in beyond this point, symptoms indicating the saturation of the system with the saline matter appear, indicated by great aversion to the waters, eructations, thirst, furred tongue, and a feeling of prostration, pointing out the propriety of discontinuing the treatment; if still persevered in, vomiting and diarrhœa, congestion of the organs of the chest and head, and other very unpleasant consequences may arise.

Dr. Braun, in his work entitled "Monographie des Eaux Minérales de Wiesbaden," has given the results of some experiments made for the purpose of ascertaining the effects of these waters on the urine, and these appear to show that a large increase in the elimination of uric acid and urea arises from their exhibition either in the form of bath or when taken internally. If these results, which will be found in the Appendix, were confirmed by further observation, they would indeed go far to explain the value of the thermal treatment pursued at Wiesbaden.

The action of the Wiesbaden waters in the form of baths has been investigated by Neubauer and Dr. Genth. Neubauer found that upon himself half an hour's bath increased the amount of water, also the urea and uric acid, and, in a slighter degree, the other urinary constituents; it also increased the free acidity of the urine; but, in Dr. Genth's case, the effect was different, as the bathing diminished the urea, and only increased to a very slight degree the uric acid. Neubauer found that drinking the waters increased the urea; Dr. Genth, on the other hand, noticed a decrease both in the urea and uric acid. It must therefore be considered that at present nothing very definite has been made out concerning the physiological effects of the Wiesbaden waters.

The Wiesbaden waters have been strongly recommended in gout, and there are certain forms of the disease in which they may be advantageously administered; they are more especially indicated for subjects in whom the circulation is sluggish and the secretions deficient, also in cases in which there is much stiffness of the joints from previous attacks. It is not uncommon for an acute attack of the disorder to supervene after the waters have been taken for a short time, and when this happens they must be discontinued. When there is much debility, the Wiesbaden treatment should not be attempted, and great care is necessary with regard to the use of the baths if there be any symptoms indicating disease of the organs of the chest, or much injury of the kidneys. I have had the opportunity of watching the effects of the Wiesbaden waters upon numerous gouty subjects, but cannot say that they have often been productive of any great amount of benefit, as they have not appeared to diminish the frequency of the attacks or to cause them to become less severe; it must in fairness be added, that patients seldom resort to Wiesbaden from this country till their gout has become chronic and very intractable.

If the waters possess the properties ascribed to them by Dr. Braun, they certainly should not bring on an acute accession, for the blood would be at once rendered too pure for the occurrence of the gouty fit to be possible. I believe the waters are more adapted to the treatment of chronic forms of rheumatism; at the same time I have little doubt that their proper exhibition in many cases of true gout may be attended with much advantage.

Dr. Robertson informed me that, after seven years' experience at Wiesbaden, he had come to the conclusion that the Wiesbaden waters have no very specific action in true gout, but are more advantageous in chronic forms of rheumatism; in gout they are useful if it be desirable to bring on an attack, which they often do. Dr. Robertson also remarked that, when baths were taken, the patients became much more quickly influenced if the temperature was under that of the body, but that most patients took them too warm.

Mineral springs of Baden-Baden.—I have had no experience of the value of these waters in the treatment of gout, but as their powers in modifying this malady have been recently tested by Dr. Ruef, and as lithia has been found to be an important element in their composition, I will introduce in this place a portion of a short article by Dr. Althaus.

"A very large quantity of lithia was found in two of the thermal springs of Baden-Baden, namely, the Fettquelle and the Murquelle, of which the former contains 0·2315 grains of chloride of lithium in sixteen ounces of water, and the latter 2·3649 grains of it. In one hundred pounds of the salt extracted from the Murquelle, nine and three-quarter pounds of lithia are contained; that is, a quantity of this substance worth 90*l.* sterling. This amount is not equalled by that contained in any other mineral spring which has yet been examined.

"In consequence of the analysis of these springs made by Professor Bunsen, they have, during the last season, for the first time been extensively used in cases of gout and lithiasis; and I am indebted to my friend Dr. Ruef, of Baden-Baden, who has treated a large number of cases of that description with them, for the following particulars regarding the result of their administration.

"The physiological effects observed after taking the waters are as follows:—At first it promotes digestion, and a feeling of well-being is induced; but after they have been taken for some time, and especially in large doses, sickness, disposition to vomiting, and diarrhœa ensue, which in most cases, however, gradually disappear, but sometimes continue as long as the water is drunk. A constant effect is an increased elimination of urine, the quantity of which is often doubled, or even trebled; it becomes turbid after some time, and large quantities of a reddish sediment are deposited in it. In some of the patients treated by Dr. Ruef profuse perspiration came on after from five to ten days, and continued as long as the water was drunk; and in the case of a lady who had not freely perspired for years this perspiration even continued two months after the cure had been finished. It therefore appears that the water is a diaphoretic as well as a diuretic.

"Concerning its therapeutic action; in almost all cases the pain in the joints is increased at first (especially in those patients who were in the end cured) to a rather high degree, but it never spread to healthy parts. In joints which were perfectly contracted, crackling, dragging, and pulling were felt, as if the articulations were being torn asunder; but after such an attack of pain a sensation of easiness and decided improvement was felt, and the mobility of the limb was much increased. In one patient, a physician from Epernay, a regular fit of gout came on during the use of the water, under the continued use of which this patient so rapidly improved, that he could walk about again after three days.

"Gouty affections of the joints, of the sheaths of the nerves and the muscles, if not of very long standing, were cured after three or four weeks, and have remained so up to the present moment. In periodically recurring headache on one side, which is often due to gout, the effects were also very beneficial. A lady who had been contracted for fourteen years, and who could neither stand, nor walk, nor carry a spoon to the mouth, was by the use of this water so much improved that she was able to walk a little, and to stand and eat by herself, while no former medication had relieved her. This patient also suffered from dysmenorrhœa, the most prominent symptoms of which were severe abdominal pain, oppression and asthma, cold and paralysis of the left arm. She had only taken the lithia water for eight days when the catamenia appeared, and were unaccompanied by any unpleasant symptoms whatever; nor did these latter reappear afterwards. In a male patient whose finger-joints were infiltrated with urate of soda, which was visible in white specks through the skin, these infiltrations were removed, and the swelling diminished.

"The mode of administering the water was as follows:—For patients with whom large quantities of water do not agree, five grains of the carbonate of lithia were added to a bottle of the water of Murquelle, which contains five grains of chloride of lithia; and the water was then impregnated with carbonic acid, in order to render the carbonate more soluble. Of this water a tumblerful was drunk three times a day; and if an increase of the dose appeared necessary, two or three grains of the carbonate were added to every glass. If patients are able to keep much water on their stomach, they may take six or eight tumblersful of the Murquelle, without any artificial addition of carbonate of lithia. Baths with water of the same spring were also given; and the Administration of the Spas of Baden-Baden are now occupied in preparing a mother-lye from the water of the Murquelle, in order to gain so much of the salt that it may next year be added to the baths. Of all the antarthritic remedies offered by the springs of Baden-Baden, none have proved so beneficial as this lithia spring. Dr. Ruef has, in some cases, at the same time employed the Russian vapour-baths, prepared from the steam of the hottest spring of the place, which has a temperature of 155° F."

Waters of Carlsbad (*Bohemia*).—A reference to the analysis in the Appendix will show that sulphate of soda is the principal ingredient of Carlsbad waters, but carbonate of soda and chloride of sodium are important constituents; in addition to which the high temperature adds powerfully to their therapeutic influence. In a certain number of patients a purgative action is induced by the exhibition of these waters, but in all cases there is copious diuresis and some excitement of the vascular system. Owing to the presence of the carbonate of soda, these waters possess the power of rendering the fluids more alkaline, and thus, in some respects, they resemble those of Vichy.

The waters of Carlsbad are employed with most advantage in gout connected with disturbance of the stomach, congestion of the portal system, and consequent enlargement of the liver, with deficient secretions from the alimentary canal; in cases, therefore, in which the disease is more especially connected with an excessive formation of uric acid. In weakened habits, or when the kidneys are seriously implicated, or when there is heart disease, these waters should not be resorted to, as they may under such circumstances be productive of serious mischief.

Dr. Kraus of Carlsbad has kindly given me some additional information as to the treatment there, which may be found useful. He says that it is a common but mistaken idea that the Carlsbad waters are merely purgative. Their action appears to depend partly on the condition or peculiarity of the patient, partly on the way in which they are taken. In some cases they cause free purgative action, but rarely anything like diarrhœa; in many cases, on the contrary, they cause constipation, and it is necessary to add some of the Carlsbad salts to the waters. In some the waters when taken tepid are more active; in others when taken hot; so that each case requires to be studied individually. The diuretic action does not appear before the fifth or sixth day, but it afterwards remains throughout the course. The urine is often rendered turbid with copious deposits.

The waters at Carlsbad are not only drunk but used in the form of the bath, consisting either of the water of the Sprudel spring or mixed with mud, to form the well known mud baths.

It is usual after a Carlsbad course to send patients for an after-cure to Teplitz or Ragatz.

Close to Carlsbad there is a spring called the Giesshübler, the water of which is mildly alkaline, and often used by gouty sufferers; it forms an agreeable beverage and is slightly diuretic.

Waters of Homburg.—Homburg is situated about 900 feet above the sea level; the air is bracing, and a delightful breeze is often felt from the neighbouring Taunus mountains. Homburg is well suited for many cases of gout, especially those in which there exists some moderate portal congestion, accompanied with deficient tone in the system. The treatment consists chiefly in the administration of the water, especially that of the Elizabeth spring in cases of gout, from one to five eight-ounce tumblers being taken before breakfast; walking, and allowing an interval of at least twenty minutes to elapse after each draught, and an hour between the last glass and breakfast.

In many cases a distinct purgative action is produced by the Homburg water, and in most a well marked diuretic action. The treatment may be looked upon as somewhat similar to that of Carlsbad, but of a much milder character.

Bathing is not an important part of the treatment at Homburg; but many when there take the so-called pine baths—baths to which is added an extract of the pine wood.

I am in the frequent habit of sending gouty patients to Homburg before or after they have been under treatment at Wildbad or Aix-la-Chapelle.

In the same category of mineral springs may be mentioned those of Marienbad and Kissingen; both of them contain a considerable amount of saline matter suitable to particular forms of gout, and those of Marienbad are alkaline, from the presence of a little carbonate of soda.

The second class of mineral waters embraces those which owe their therapeutic powers more especially to the influence of the water itself, often increased by its high temperature. The more important are those of Wildbad, Teplitz, Gastein, Ragatz and Pfeffers, Buxton, and Bath. The analyses of the more important of these waters will be seen in the Appendix, and they may be taken as types of the whole class. The mineral constituents are insignificant, and can add but little to the therapeutic properties of the water itself; as regards the Buxton waters, an attempt has been made to refer their action to the large amount of contained nitrogen, but, to say the least, the explanation is very problematical. These waters are more especially used in the form of the bath, or douche, but many of them are advantageously employed as internal remedies.

Waters of Wildbad (*Black Forest*).—Within the last few years I have had much experience of the value of the Wildbad treatment in gouty subjects, and it may be useful to state shortly the results I have arrived at. On looking at the table in the Appendix it will be seen that the waters at Wildbad are warm, varying from 90° to 98° Fahr., containing but a small amount (three and a half grains in sixteen fluid ounces) of solid matters, consisting of about one half of common salt with small quantities of bicarbonate of soda, together with some dissolved gases.

These waters may therefore be looked upon as belonging to the so-called indifferent thermal class.

The little town is prettily situated in the Black Forest about 1300 feet above the sea. The waters are chiefly used in the form of the bath, but they may also be advantageously drunk by the majority of patients. Although apparently so much like ordinary warm water, as far as composition is concerned, their effects on the system are by no means so inert. I have known patients, who have had joints or other parts previously injured by disease or accident, experience severe pain in these parts after the use of the Wildbad baths, to such an extent as to lead them to discontinue their use for a time.

Occasionally in gouty subjects the disease is brought out by their action, but by no means so frequently as at Wiesbaden.

The subjects of gout who receive most benefit from the Wildbad treatment are those whose nervous system is undertoned, and in whom there is little or no congestion or other derangement of the portal system. The effects I have witnessed have at times been almost marvellous; many patients accustomed for a long time to have from two to four severe attacks every year have, after taking a course of the Wildbad baths and waters, remained free for one or two years.

Wildbad appears to be especially advantageous where there is great inability to regain the use of the limbs after gouty attacks; in fact, in cases of nervous paralysis in connection with this disease. In some few instances I have been positively assured that small chalk-stones have disappeared under the treatment.

The water when taken internally, and when it sits easily on the stomach, increases the action of the kidneys and skin. At times, where there is constipation, it is desirable to add a little of the natural Carlsbad salts to a glass of the Wildbad waters.

If a patient stays in the bath beyond the proper time, a feeling of fulness of the head is experienced, and not unfrequently a slight amount of giddiness is produced.

The air at Wildbad is not very bracing, and I am constantly in the habit of sending patients after the course to some of the high parts of Switzerland or to Homburg, where it is sometimes advantageous to supplement the Wildbad treatment by a short course of the Elizabeth spring which is mentioned above.

Waters of Teplitz.—A very large portion of the visitors at Teplitz labour under some form of gout, and it is asserted that much benefit is derived from the administration of the waters.

The Teplitz springs, as those of Wildbad, are most suitable in gout attended with debility, and the baths are especially indicated when the stomach is unable to bear a large quantity of liquid; long immersion in a water of low specific gravity, and one containing but little solid matter dissolved in it, is favourable to endosmosis, and hence considerable absorption ensues. As the solid ingredients consist chiefly of carbonates of soda and lime, with traces of iron, a slight increase of alkalinity is given to the animal fluids, as likewise some stimulant action to the secreting functions, effects which equally result, whether these waters are administered in the form of the bath, or taken internally.

Waters of Buxton (*Derbyshire*).—As so many of our countrymen resort to Buxton each year, it is well that I should give my opinion of the value of the treatment pursued there in gouty cases.

Buxton is situated about 1000 feet above the sea level, the soil is dry and the air very bracing; the water has a temperature of 82° Fahr., contains very little solid matter, and has a large amount of nitrogen dissolved in it.

The water is chiefly used in the form of the bath, but is likewise taken internally. The duration of the bath is short, about ten minutes.

Gouty patients often experience great benefit from the treatment; recovering the use of limbs which have become useless from prolonged gout, and at the same time a great immunity from attacks is often given. The internal use of the water usually causes diuresis.

In their effects the Buxton waters resemble closely those of Wildbad and Gastein; the temperature of the water is however much lower than at those latter places, and many patients cannot easily bear the chill produced by it. To avoid this it is a common practice at Buxton to heat the water artificially to about 95° Fahr. As the air at Buxton is very bracing, considerable benefit is often produced in relaxed habits by a sojourn at this place, irrespective of the use of the baths.

The above remarks on the Wildbad, Teplitz, and Buxton waters apply to the treatment at many other spas, more especially to those of Gastein, Pfeffers and Ragatz, Schlangenbad, Plombières, and Bath, all of which contain but a trifling amount of mineral ingredients. With regard to the efficacy of Bath waters, Heberden made the remark that he had not been able to see any good result from their external use, either when gout was present or in the intervals; on the contrary, he thought they appeared rather to increase the weakness of the limbs.

Ferruginous Waters.—In a very limited number of cases of gout, especially after a course at any other spring, the ferruginous waters may prove of considerable value; the most important of such waters are found at Spa, Schwalbach, Pyrmont, and St. Moritz.

Mineral Springs of Aix-la-Chapelle (Rhenish Prussia).—The waters of Aix-la-Chapelle are characterised by their peculiar odour, and many of the springs have also a high temperature; although apparently differing from the mineral waters we have hitherto considered, more minute examination shows that the difference is by no means so marked as might be at first anticipated. The principal spring is the Emperor's (Kaiserquelle), the water of which is clear, smelling strongly of sulphuretted which want of space prevents me from incorporating in the present work. The remarks on the value of the waters of Aix-la-Chapelle and Aix-les-Bains in the treatment of gouty affections, apply more or less to those of other sulphur springs, such as Luchon, Barèges, &c.

From what has been now advanced concerning the nature and action of the several mineral springs which have acquired reputation in the treatment of the different forms of gout, it is evident that much caution is necessary to prevent the occurrence of mischievous consequences, and considerable judgment demanded to ensure success.

The rules I now subjoin will safely guide the practitioner either in advising or in proscribing the exhibition of mineral waters in gouty cases.

They should be altogether prohibited when there is considerable structural disease in any important organ, especially in the heart or kidneys; and even when the organic mischief is slight, the greatest caution is necessary in their use.

They should be avoided when an acute attack is either present or threatening.

The waters should be selected according to the nature of the case. When the patient is robust, and of full habit, the alkaline saline springs; when torpidity of the bowels predominates, the purgative waters; when there is a want of vascular action, the saline waters; when the skin is inactive, the sulphur springs; lastly, when debility prevails, then the more simple thermal waters should be chosen.

In all cases caution is necessary at the commencement of a course of mineral waters, and care should be taken not to oppress the stomach by giving too much liquid, nor to induce debility or any other injurious effects by allowing a too long sojourn in the bath.

In conclusion I may add, that although great benefit is undoubtedly often obtained from a sojourn at these Spas, yet too much must not be expected from the exhibition of mineral waters, as their influence, even when most advantageous, endures but for a comparatively short time, whereas the causes of the disease are, in many cases, in constant operation.

CHAPTER XIV.

IRREGULAR FORMS OF GOUT:—PRELIMINARY OBSERVATIONS—DIFFICULTIES IN THE INVESTIGATION OF IRREGULAR FORMS OF GOUT—MODE OF ASCERTAINING THE TRUE NATURE OF DIFFICULT AND ANOMALOUS CASES—RETROCEDENT OR METASTATIC GOUT—IMPLICATING THE STOMACH, INTESTINES, HEART, AND HEAD—OTHER FORMS OF ABARTICULAR GOUT—IMPLICATING THE DIGESTIVE ORGANS—THE HEART—THE RESPIRATORY ORGANS—THE URINARY ORGANS—THE EYE—THE EAR—THE LARYNX—THE SKIN—THE MUSCULAR AND NERVOUS SYSTEMS—TREATMENT OF THE DIFFERENT FORMS OF IRREGULAR GOUT.

WE now approach a subject beset with difficulties, and one which requires the most careful exercise of the judgment in order to arrive at results satisfactory to the pathologist. That there are irregular forms of gout must be conceded by all who have turned their attention to the study of this disease, and daily experience confirms the concession. It is not uncommon to find patients showing symptoms which may be properly classed under this head, some little time before the advent of a fit of gout, and although such symptoms may disappear on the occurrence of the paroxysm, yet they occasionally continue, in a mitigated form, during the progress of the articular inflammation; now and then, indeed, they occur in subjects who have never experienced a true fit, but who either inherit gout, or at least have been much exposed to its predisposing causes.

When at any time we can demonstrate that these symptoms depend upon the same diathesis as leads to the inflammation of the joints, we are certainly justified

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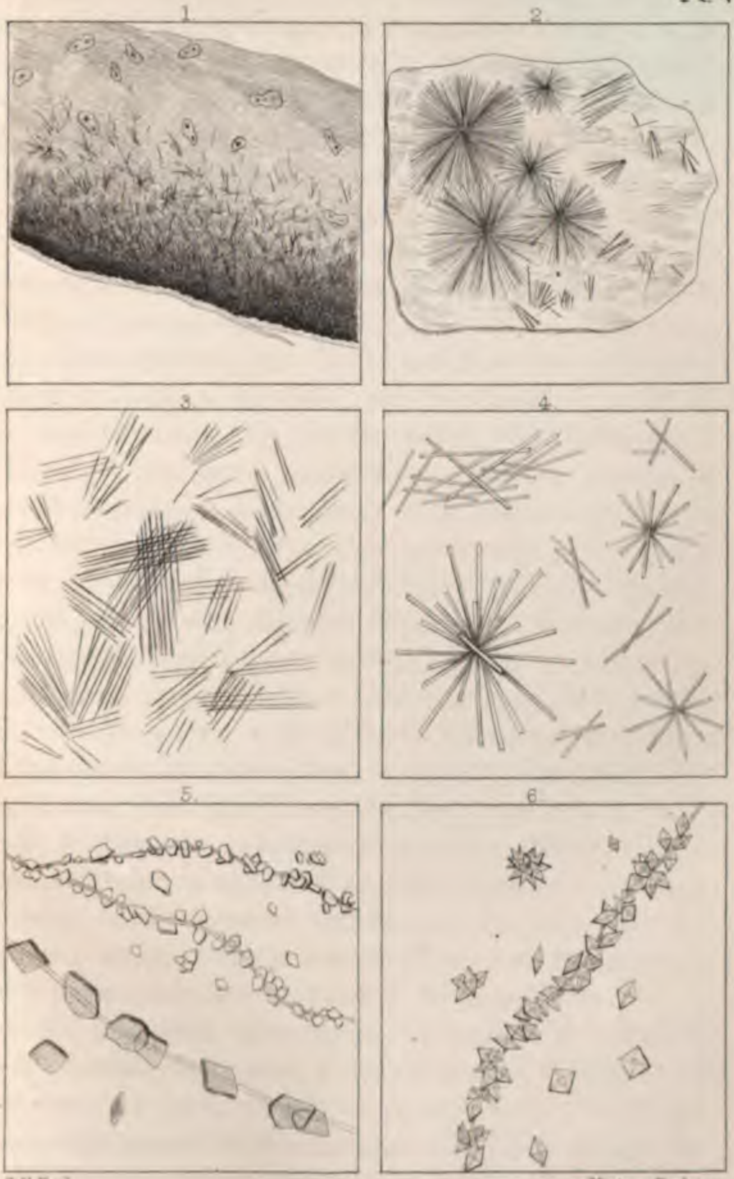

G. H. Ford.
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in considering them irregular manifestations of gout. The difficulties in distinguishing the true nature of such anomalous symptoms are many; for we must remember that such patients may be affected with both functional and organic diseases, not necessarily gouty; for example, pleurisy may occur from exposure to cold, bronchitis from a similar cause, and although the course of these diseases in such subjects may to some extent be influenced by the diathetic condition, yet such complications can scarcely be looked upon as simply gouty: that this has been commonly done there is little doubt, and thus have arisen the numerous forms of irregular gout described by many of the older writers in this country and on the Continent.

Many of the more powerful predisposing causes of gout tend likewise to produce other diseases, but these latter, when they occur, are not necessarily gouty; such causes, for example, will not unfrequently lead to cardiac diseases, as chronic valvular alterations, atheroma, and hypertrophy, and I have ascertained, by post-mortem examination, that even when such changes occur in subjects who have long been afflicted with gout, they have not the same character as those essentially connected with this disease; examples illustrating this point will be found in the chapters on pathological anatomy. The long-continued existence of chronic gout often leads to a depraved condition of the general nutrition of the body, and the slow production of many organic diseases, a circumstance which must not be lost sight of in the inquiry.

From a careful examination of numerous recorded cases of anomalous gout, I am of opinion that many of them have no real claim to be so considered; some are in no way related to the disease, and others only so far as they occur in gouty states of the habit. On the other hand there can be no question that the same systemic condition which ordinarily leads to the development of regular gout, may at times produce symptoms altogether apart from the joints, but which are still essentially of a gouty character.

Having made these preliminary remarks we are better prepared to direct our attention to the investigation of irregular forms of gout, remembering that it is of the highest importance to the advancement of medical science that we should not use the latitude which the term affords us as a cloak for our ignorance of the nature of any disease, but be careful to apply the name only to such instances as we can clearly demonstrate to depend on a gouty state of the system.

Irregular forms of gout have received various names, as *anomalous gout*, *non-articular gout;* and by the French certain varieties have been named *goutte larvée* and *goutte vague;* at times the term *misplaced gout* is employed; but some writers include all these different affections under the head of *atonic gout*, as they are frequently met with in conditions of the system characterised by want of tone.

Upon examining a case suspected to be one of irregular gout, we should first investigate the history, in order to find if there is any hereditary predisposition to the disease, and to what degree this exists; and also to discover if the predisposing causes of gout have been operative. The age and sex of the patient should likewise have due weight in the inquiry.

It should be ascertained whether there has been any joint affection, and, if so, the peculiarities which it exhibited; it is also important to ascertain if the symptoms, supposed to depend on the gouty state of habit, are influenced by causes known to affect, in a marked degree, true gout.

If there is still doubt as to the nature of the case, it may occasionally be desirable to examine the condition of the blood, by which means a clue may be generally obtained, for, as we have proved that gout is invariably attended with impure blood from the presence of uric acid, it follows that when, in anomalous cases, the blood is not so altered, the symptoms cannot depend on a gouty diathesis; if, on the contrary, the blood exhibit such impurity, it is a matter of high probability that the phenomena are so connected. I say probability rather than certainty, inasmuch as uric acid occasionally exists in the blood without the production of any characteristic symptoms.

In order to reduce the phenomena of anomalous gout to a scientific precision worthy of the present age, the above considerations must not be lost sight of; for if the facts advanced in the preceding chapters be correct—and that they are so, satisfactory evidence has been adduced—I have no hesitation in affirming that what has now been stated with regard to the blood in cases of irregular gout must be also true.

There is generally some little difficulty in these cases in determining the presence of uric acid in the blood, as venesection is seldom absolutely requisite, and there is a natural repugnance to its performance, although but a single ounce be required. In such instances, I have occasionally had recourse to a small blister, the application of which is sometimes advisable as a therapeutic agent, and can never be productive of injury; it must be confessed, however, that the examination of the serum from a blister is not so satisfactory as of that from blood, although, when positive evidence of the presence of uric acid is afforded by it, the results are equally conclusive.

In treating of irregular gout I shall first speak of that form denominated retrocedent or metastatic, and then proceed to describe the other varieties according as they affect different organs or tissues of the body.

RETROCEDENT GOUT.

Gout is named retrocedent when a sudden disappearance of the articular affection is followed by serious mischief in some internal viscus, as if a metastasis or change of position had taken place: the organs usually attacked are the stomach, intestines, heart, or brain. That such a metastasis of gouty inflammation occasionally occurs is undoubted, but it is no less true that in the majority of the recorded instances considerable mischief had previously existed in some important organ, which proved the immediate cause of the so-called metastatic action. To separate true from spurious cases is a task of much difficulty.

Gout retroceding to the stomach.—When the stomach is attacked, the symptoms indicating the transference of gout are an intense feeling of oppression and anxiety, often accompanied with spasm, pain, and vomiting. Coste relates the case of a soldier who checked the inflammation of his joints by the application of spirits of camphor, and was immediately seized with cold sweats, and vomiting of a green-coloured bile. Sydenham appears to have suffered from similar symptoms on the retrocession of gout from his limbs.

Scudamore relates two cases of this form of disease, of which the following are short abstracts:—

Case 1.—A corpulent man, aged 47, had suffered from gout for twenty-five years, and had been treated with large doses of the eau médicinale, which much depressed him, and had also left off wine, in which he formerly indulged. Having one day been exposed to cold and damp when suffering from gouty symptoms in his feet, although he felt no inconvenience at the time, yet on the following night he was suddenly seized with excruciating pain in the stomach, and such an oppression from flatus that he thought his stomach would actually burst: hot fomentations, ether, opium, and brandy-and-water relieved the alarming symptoms, which were followed by a severe paroxysm of gout in the knees and feet.

On another occasion this gentleman, from exposure to cold, had a return of symptoms, though of a different character; a kind of torpor ensued, the pulse became slow and languid, the skin cold, features collapsed, and breathing laboured, and both speech and deglutition were difficult; stimulants were again successful in giving relief.

Case 2.—A gentleman, aged 52, had his first attack of gout when 31 years old, affecting one of his feet. When still suffering from gouty symptoms, and after having eaten heartily and drunk madeira-and-water, he was exposed to the cold air. Suddenly there occurred an alarming oppression of breathing, cold perspiration, and a sensation of burning rising up from the bowels, but no pain; also nausea, and a feeling of sinking, so as to cause an apprehension of fatal syncope: there was likewise palpitation of the heart. After drinking warm water, so as to produce vomiting, a large amount of acid matter was ejected from the stomach, with immediate relief. At the time these symptoms were urgent the foot became easy, but on their abatement there was a return of acute gout in the part. This patient had a subsequent attack of retrocedent gout of a similar character.

Several cases resembling the above have come under my notice; cases in which pains in the epigastrium, vomiting and faintness have supervened upon the retrocedence of articular gout. There can be no doubt that many of these cases are not inflammatory, but due to intense functional disturbance of the stomach, and we know that shocks to the nervous system, as from powerful mental emotions, especially soon after a meal, will cause intense indigestion, and it may be that the sudden repression of gouty inflammation of a joint is capable of influencing the nervous system in the same way. The following is a fair example.

A gentleman, about 69 years of age, who had had slight attacks of gout for fifteen years, experienced the following symptoms. When suffering from inflammation of one foot, he all at once felt extreme pain in the epigastrium, accompanied with vomiting; the pain in the foot suddenly left him and remained away till the gastric disturbance had become relieved, it then returned in some degree.

I cannot, however, think that all cases of gout retroceding to the stomach are simply functional, as I have had some which tend to disprove this idea. Very recently I was called to see a gentleman who had been suddenly seized with vomiting, which soon became quite uncontrollable, and led to a fatal result. In this case there was great tenderness over the stomach and some amount of febrile disturbance.

This patient did not inherit gout, but had for many years lived freely; he had also experienced a distinct gouty attack in one great toe the previous year and a week before the sickness had had a slight return in the feet, which left before the gastric symptoms came on.

Hunter was inclined to regard the effect of gout on the stomach and bowels as altogether dissimilar to that upon the extremities; but Scudamore thought that the established theory of an occasional transference of inflammatory action from external to internal parts, in cases of gout, had been clearly made out, and that it was important in practice as well as admissible in doctrine.

Gout retroceding to the intestines.—Dr. Home relates the case of a gentleman who exposed himself to heat and cold when suffering from slight gouty inflammation of the feet; the same afternoon enteritis followed and in twelve hours he died.

About six years ago I was summoned to see a patient whose case can be thus shortly summed up. He was about 50 years of age, and for many years had suffered from gouty attacks, some very severe and prolonged. When recovering from a moderately acute attack in the extremities he was exposed to cold; he felt chilled, and within a few hours complained of pain in the abdomen, this increased and was accompanied with great constipation; after a time the pain became very intense, the abdomen tympanitic, vomiting ensued, the pulse gradually got quicker and weaker and the patient sank.

A post-mortem examination revealed the nature of the case. The last eighteen inches of the ileum were found intensely inflamed, but the rest of the abdominal organs healthy; it was evidently a case of enteritis, and, in all probability, of a gouty nature.

Gout retroceding to the heart.—When the heart is seized with retrocedent gout, there is usually a feeling of constriction about the chest, violent palpitation, intense anxiety, difficulty of breathing, accompanied by a very small thready pulse and other signs of syncope. A well-marked instance of this form of retrocedent gout is related by Dr. Alexander of a gentleman, who, when suffering from a severe attack of gout, very imprudently applied snow to the painful foot, which produced at first great relief from the pain, but was soon followed by a sensation of burning and constriction at the lower part of his chest, as if a red-hot iron wire had been placed round his body, and was being pulled tighter and tighter; after this he could remember nothing; he was found sitting in his chair, with his usual florid complexion changed to a death-like pallor, respiration exceedingly slow and snatching; pulse 40, and almost imperceptible. He was restored by the aid of stimulants and counter-irritants. It was evident that in this instance the cold application produced powerful spasm of the heart, leading to extremely defective action.

A well-marked case has very recently (1876) come under my care. The patient was a gentleman about 50 years of age, who had occasionally suffered from fits of gout in the feet, but otherwise was in very good health; after a two years' interval he had a sharp attack in one foot implicating the arch as well as the ball of the great toe; when much better he went out, during the prevalence of cold east winds, and in a few hours felt violent pain across the chest and down both arms, accompanied with faintness and a sensation of alarm. These symptoms lasted some hour or more, and were followed by two or three more similar attacks that night, and another the next morning. After this I saw him and found the pulse very quick and feeble and frequently intermitting. Under treatment these symptoms soon left him, but in a few days the foot became again affected with gout. There was no evidence of structural disease of the heart, and no appreciable febrile disturbance.

Whether the heart is ever attacked with gouty inflammation is still a matter of doubt, for the evidence in support of its occurrence is by no means conclusive. That it is frequently spasmodically affected is certain, and probably, in most of those cases of retrocedent gout which have proved fatal, some cardiac mischief, as valvular disease, dilatation, or fatty degeneration, had existed previously.

Gout retroceding to the head.—When retrocedent gout attacks the head, apoplexy is commonly induced, but maniacal symptoms occasionally arise. When the apoplexy has terminated fatally, serous effusion has been found in the brain; retrocedence of this kind usually arises from the application of cold to a gouty limb, as by plunging it into cold water. That gouty inflammation should implicate the fibrous membranes of the brain, as the dura mater, might be expected, but it seems probable that, in many of the cases in which apoplexy has supervened, the brain was previously in a state of ramollissement, or otherwise diseased. I believe no demonstration has ever been afforded of the presence of true gouty deposits in these structures.

Within the last 15 years several instances have come under my notice of patients who have had marked cerebral symptoms upon the sudden disappearance of gout from an extremity; two of these I will shortly relate. The first was a clergyman, living a few miles from London, about 60 years of age, and a great martyr to gout; he had had a moderately acute attack in the feet and was slowly recovering; he, however, undertook duty at his church, the weather at the time being very cold; after the sermon, instead of returning to the rectory, he went to the railway station and took a ticket to London, and was found there in a few days completely insane; he subsequently got better.

In the second case the patient was nearly 80 years of age, and, when still suffering from gout in one hand, went out in the depth of winter to see his sons shoot; he returned apparently well, and congratulating himself that his hand had so much improved; dined as usual, but before bed-time became rambling in his talk, and soon afterwards completely delirious. Efforts were made to bring back the gout to the hands, and in about ten days he completely recovered. Four years after this I attended this patient for an ordinary attack of gout.

Dr. Copland relates an instance, which came under his notice, of a medical man who experienced symptoms of gout in several organs within the space of a few hours; he had had an imperfect attack in the foot, and on its forsaking this situation, the bowels became affected with violent colic, it then flew to the diaphragm and lungs, causing the most urgent dyspnœa, and lastly the head was implicated in a slight degree; after this the disease again appeared in one foot, and subsequently in the other.

OTHER FORMS OF ABARTICULAR GOUT.

Having given a slight sketch of those sudden, severe, and obscure attacks to which gouty patients are occasionally subject, and to which the term retrocedent gout has been applied, I shall now lay before the reader some account of other forms of gout when it implicates organs and structures other than those of the joints, that is when the disease assumes the character of abarticular gout.

Gouty affections referable to the digestive organs.— Symptoms mainly referable to the digestive organs have already been described as being frequently premonitory of an attack of gout, but it is not uncommon to find severe and protracted dyspepsia in patients who have never suffered from a fit, but who either inherit the disease very strongly, or have sown the seeds of it by their mode of living; in such cases the derangement of the digestive organs is doubtless frequently dependent on a gouty state of the blood. It is often a matter of considerable difficulty to make a correct diagnosis in these instances, but at times this difficulty is at once removed by the sudden supervention of a true fit of articular gout, and the equally rapid disappearance of the gastric disturbance. Such relief, however, is not always experienced, and patients may suffer for months and even years without the nature of their ailment being discovered, and this occurs more especially in persons who have led a very temperate life, but who are strongly predisposed to the disease: slight threatenings, however, of the toe affection are sometimes, on inquiry, admitted to have been felt, sufficient in many cases to render the pressure of the boot uncomfortable.

Besides the symptoms already described as premonitory of a fit, other gastric phenomena are occasionally met with, as gastrodynia, pyrosis, and enterodynia.

A gouty state of habit is often accompanied by constipation, but sometimes diarrhœa ensues, and I have known several individuals who appeared to have escaped articular gout by the frequency of such evacuation from the bowels.

The gastric disturbance which precedes acute gout is usually increased in the chronic form of the disease; to such an extent indeed, that the patient may be completely tormented in the intervals of the joint affection, and unable to bear the slightest irregularity of diet; this form of dyspepsia probably depends on the impurity of the blood, arising often from the impaired state of the kidneys, as it is usually a prominent feature in disorders directly connected with a granular state of these organs.

I have met with one instance in which the œsophagus was distinctly affected, so as to cause the greatest difficulty in swallowing, a symptom at once relieved by the occurrence of articular gout: cases are on record in which the rectum has been constricted from the same cause, and it should be remembered that hemorrhoids, due to the congested state of the portal system, frequently occur in gouty subjects.

The following examples are illustrative of this form of gout, and are selected from among very numerous similar cases which have come under my care:—

Case 1.—A gentleman, aged 64, whose general health had usually been good, came under my care with the following symptoms. For the last two years he had suffered from pyrosis and attacks of violent retching, but with little vomiting, occasionally however he had noticed a streak of blood. He had lost flesh but was not emaciated. The sickness occurred chiefly in the morning, and about two or three times in the fortnight. He was troubled with frequent and severe cramp. Upon inquiry, I found that this patient had for more than twenty years been subject to periodic attacks of gout, generally in the spring of the year, and affecting the great toes and knees; but, during the time in which the dyspeptic symptoms had been present, scarcely any symptoms of articular gout had been manifested, or merely twinges in one of the toes. Thinking it probable that the stomach affection was closely connected with a gouty state of the system, I prescribed accordingly and had very soon the satisfaction of finding the disease rapidly give way, and the patient in a little time completely recover his health.

Case 2.—A gentleman, about 40 years of age, who had for some time lived freely, was suddenly attacked with violent pain in the stomach, accompanied with intense depression of spirits; after a few days these symptoms were suddenly relieved by the occurrence, during the night, of a sharp fit of articular gout affecting first one then the other great toe. This was the first time he experienced any attack of the disease.

Case 3.—A gentleman, 53 years of age, of somewhat spare habit, inheriting gout from his paternal grandfather, first experienced some pain in the great toes about ten years since; three or four years afterwards, he had an affection of the right shoulder, which passed off without treatment. About a year and half since he suffered from a very severe attack of gastralgia, apparently caused by mental anxiety; this was accompanied with slight jaundice, but not followed by any joint affection. About a fortnight before I saw him he experienced a second attack of gastralgia which was very acute; this suddenly ceased on the occurrence of sharp inflammation of the left knee.

Gout affecting the heart.—One of the more common symptoms produced by a gouty state of the system is palpitation of the heart, accompanied with irregularity of its rhythm, and occasionally with pulsation of some of the larger arteries. In the majority of instances this condition is secondary to dyspepsia, but at times it may be directly excited by the impure condition of the blood, and I have notes of many cases in which no organic mischief in the heart could be discovered, nor any signs of indigestion, and in which the symptoms ceased on the occurrence of gout in the joints; but in many gouty patients in whom palpitation is prominent and constant, hypertrophy or valvular disease exists sufficient to account for the symptom. It has been thought that the structures of the heart are sometimes the seat of gouty inflammation, and great probability is supposed to be given to this idea, from their being so constantly affected in acute rheumatism; that such may occasionally occur I do not deny, but doubt if it is common. It is altogether an error to consider calcareous deposits a proof of gouty inflammation, for I have shown in a former chapter that even in gouty subjects who have concretions of urate of soda in all the joints, the deposits upon the aorta may be of a totally different character, consisting either of phosphate and carbonate of lime or of cholesterine and fatty matter. Dr. Stokes has observed, that when death has been attributed to gout in the heart, the result has usually been owing to some organic disease of that organ, and not, as generally supposed, to the direct influence of gout, a remark in which I most fully coincide. Arteritis, or at least an irritable condition of the aorta, is also occasionally produced by gout, and in some instances has caused a suspicion of the existence of aneurism.

There is a symptom by which I believe we can usually decide whether the disturbance of the heart is functional or organic, independently of the stethoscopic or other signs; viz., by the absence or presence of breathlessness. In functional disturbance the patient is often more conscious of the irregular action of the heart, but there is usually an absence of any appreciable want of breath; whereas, when organic mischief is present, breathlessness is generally a marked symptom, though it may not be referred by the patient to the disturbance of the heart.

Gouty affections of the respiratory organs.—Coughing and asthmatic breathing are frequently produced by a gouty state of system. A gouty cough is recognised by all practitioners, and often precedes and accompanies the regular forms of gout; occasionally dyspnœa of a very severe character, and to such an extent as to cause alarm, is connected with the presence of latent gout. A patient was once under my care, having, it is true, some slight emphysema, but suffering from great dyspnœa, so as to be unable to lie down, and was also much distressed by a hard dry cough; the usual treatment, by dry cupping, counter-irritation, and expectorants, was adopted, but with little or no relief; after a few days, the chest symptoms suddenly vanished and gout occurred, first in the ball of the left great toe, and afterwards in the knee. Many cases of a similar nature have come under my observation, and others are on record, all of which clearly point out that the respiratory organs are sometimes affected by gout.

The pleuræ may be occasionally implicated, and a species of dry pleurisy produced; the diaphragm may be attacked, and violent spasmodic cough induced; asthma has also been noticed to be common in gouty families, and is probably due to the presence of an impure state of the blood.

I cannot help thinking, as the result of much experience, that, in almost all the cases in which the respiratory organs are thus affected, there is likewise present some structural mischief; often, it is true, very slight, but sufficient to determine gouty action to these parts.

Gouty affections of the urinary organs.—It is not uncommon to find gouty patients complaining much of irritability of the bladder, sometimes accompanied with an increased discharge of mucus, and generally with scanty and high-coloured urine which gives rise to a copious deposit on cooling. Such symptoms often occur in the intervals of gout, sometimes in subjects in whom regular gout has never developed itself. Scudamore relates cases of the former kind in which there was a purulent discharge, relieved by the occurrence of gout in the feet; but from the description of the articular affections in some of these instances, I should be inclined to question their strictly gouty character, and should ascribe the discharge to other causes. Some years since I was consulted on the case of a gentleman who was suffering from the following symptoms: great irritability of the bladder, shown by constant desire to pass water, and inability to sit still for many minutes; urine very scanty and thick from a pale deposit of urates, closely resembling pus; pains in the hips and much palpitation of the heart; so marked were the symptoms that the presence of a stone in the bladder had been suspected by his medical attendant. From the history of the case it appeared that during the last year the patient's habits of life had been considerably changed; instead of taking much exercise and living plainly, he had led a comparatively inactive life and lived freely. From these circumstances, I was induced to suspect that the symptoms depended on a gouty habit, and treatment given with a view to correct this soon proved completely successful. Dr. Todd relates a case of cystitis apparently connected with the presence of gout, and many other instances in which the bladder has been involved are on record.

The kidneys are occasionally attacked with acute gout, and when this takes place there is pain in the back and other symptoms found in nephritic forms of disease. From what has been stated in this work with regard to the altered structure which these organs exhibit in the majority of cases of chronic gout, it is not a matter of surprise to find indications of its existence during life. My own observations lead me to think that gouty inflammation is often set up in the interior structure of the kidney, accompanied with deposits, not merely within the tubuli uriniferi but in the fibrous tissue itself. It may be that this structure, from the circumstances in which it is placed, being in constant contact with a fluid having an acid reaction, is selected as the early seat of gouty deposition; that it is frequently so chosen, proof has been afforded in the fact that white points of urate of soda were observed, with few exceptions, when these organs were examined. Although the ball of the great toe is apparently selected in the majority of instances for the first invasion of gout, it is quite possible to conceive that the fibrous structures of the kidneys may occasionally take the precedence though not recognisable by any subjective phenomena. In many cases of articular gout I have known the urine to become albuminous for a time, but afterwards to be quite free from this principle; in some of these instances the albumen may have been due to the temporary presence of gouty inflammation in the renal organs. In a few patients I have found that severe pains in the back, such as could not be referred to nephritic calculi, have preceded the development of gout in the joints, and have been speedily relieved by its occurrence.

We occasionally find that patients have, without any assignable reason, an unusually long interval between the attacks of articular gout, and I have reason to think from clinical observation that in many of these cases the kidneys have become implicated during such periods, for not unfrequently I have afterwards found a trace of albumen in the urine. When this is the case, although there has been a freedom from joint affection, there has been no improvement in the general health.

Instances are on record, and I have seen many in my own practice, in which the prostate gland and testicles have been affected with gouty inflammation and spasm, and the symptoms have been suddenly relieved on the occurrence of gout of the extremities; I suspect that in some of these cases some little mischief has previously existed in these parts, and the symptoms were much aggravated by the gouty action.

Gout of the eye.—A form of ophthalmia connected with gout has long been recognised, and appears to be tolerably well established, but as rheumatic inflammation of the eyes is equally allowed to exist, difficulties may at once arise in the diagnosis. I have witnessed many cases in which conjunctivitis and sclerotitis appeared to be distinctly connected with the gouty diathesis, and in two cases there existed deposits of urates on the surface; gouty iritis also occasionally occurs. I once saw a case of acute inflammation of the sclerotic coat and iris, which supervened a few days after the operation for cataract in a gouty subject. By active treatment the disease was arrested, but distinct articular gout soon manifested itself.

Our information on this subject may be thus summed up. Patients having a well marked gouty diathesis now and then experience attacks of inflammation of the different structures of the eye; and it is important to bear in mind the fact that the state of the habit considerably modifies and keeps up such affections; and also that treatment directed to the gouty condition of the system proves very effectual in curing the local mischief.

Gout of the ear.—Frequent reference has been made to the presence of little urate nodules upon the cartilages of the ear, and it has also been noticed that patients occasionally experience pains in the ears prior to an ordinary fit of gout. Dr. Graves, without mentioning the appearance of these small chalk-stones, refers to the twinges in the ears, but attributes them to momentary congestion, and alludes to a gentleman whose ear was sometimes attacked with agonising pain, but which never lasted more than a few hours. Dr. Graves himself also suffered from similar attacks, which disappeared on the occurrence of gout in the fingers.

When deposition of urate of soda takes place in the fibro-cartilage of the ear, but little disturbance ensues compared with what results from the presence of the same matter in the articular cartilages of the joints, and hence in many patients it is scarcely noticed; the phenomena, however, are exactly the same as when a joint is affected, and constitute in fact a true gouty paroxysm, commencing with infiltration of the tissue and subsequent inflammation; the difference between gout in the ear and in a joint depends mainly on the little inflammatory action in the former case, arising from the indifference of the fibro-cartilage to the presence of the foreign body.

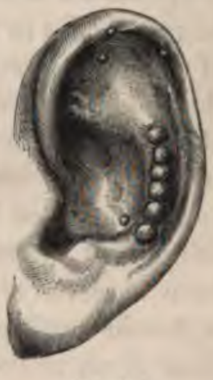

Fig. 25.*

I have seen many cases in which the ear symptoms have proved very annoying, so that patients have been unable to rest their ears on the pillow; in one case the amount of urate deposit was excessive, six large nodules being situated in a row on the antihelix of the left ear, besides other smaller spots scattered about. A drawing of the ear is shown in fig. 25.

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* Fig. 25. Left ear of a gouty subject, in which the urate deposits were especially prominent.

On one occasion, when this patient became much weakened, these nodules softened to a creamy consistence, and from some of them a free discharge took place.

Deposits are not unfrequently found upon the drum and the ossicles of the ear, but I have failed to discover uric acid in any which I have examined. I am inclined to regard the alterations which I have now and then seen in the bones of the ear as indicating the presence of rheumatoid arthritic disease rather than true gout.

Gouty affection of the larynx.—In one instance only have I seen what appeared to me to be a true gouty disease of the larynx. It occurred in a gentleman sixty years of age, who had been a martyr to ordinary attacks of the disease for twenty years or more, and many of whose joints had become much stiffened by deposits. He had numerous nodules of urate of soda on the ears, and very large deposits in the bursæ of the elbows, one the size of a Chinese orange. About three years before his death the voice gradually became affected, till at last he had almost complete aphonia: there was also slowly increasing pain and difficulty in swallowing, which ultimately hastened his death. There was no opportunity afforded of afterwards examining the larynx, but as I have observed a deposit of a true gouty nature on the arytenoid cartilages in one of the post-mortem examinations given above, I cannot help thinking that in this case the same change had ensued, causing rigidity of the articulations.

Gout affecting the skin.—Inflammation of the skin over an affected joint generally accompanies regular attacks of gout, but in these cases it seems to be only an extension from deeper-seated structures, and the skin is not primarily implicated. It is a point of much interest to ascertain if cutaneous diseases ever occur in direct dependence upon a gouty state of the system, and it will be found in the sequel that there is much evidence in favour of the idea.

Dr. Graves mentions that he once met with a singular affection in connection with gout, and quotes the case of an elderly lady of gouty habit, who was liable to a daily paroxysm of the following character. About three o'clock in the afternoon her nose became hot, and the heat continued for four or five hours, the skin being first of a bright red then of a purplish colour; this redness spread to the upper part of her cheeks, and was accompanied by uneasiness but no pain, and always subsided about the same hour in the evening.

Skin diseases dependent on a gouty diathesis.—Instances of the occurrence of skin disease of various forms in direct connection with a gouty state of the system are often met with, and are of considerable interest to the physician. The forms I have noticed are prurigo, general or local, pityriasis, psoriasis in its different varieties, eczema, and acne.

Prurigo is of most common occurrence, frequently confined to a part, especially the anus, and the vulva also in females, more especially after the cessation of the catamenia. When the prurigo attacks the anus it is frequently accompanied with piles, and if bleeding occur, it is generally relieved to a considerable extent for the time. Sometimes the prurigo is much more general, and I have now and then seen almost the whole of the surface affected. It is not unusual to find that when in such cases the joints become inflamed, the skin annoyance ceases, at least for a time.

Pityriasis and Psoriasis.—These affections, more especially the latter, are very common in gouty subjects; and in my case books I have records of scores of patients who have thus suffered.

Sir H. Holland states that he has often seen psoriasis prevailing in gouty families, sometimes alternating with acute attacks of articular gout, sometimes suspended by them, sometimes seeming to prevent them in individuals thus disposed: and that it is difficult not to assign the same morbid cause to these results, however unintelligible its mode of action under such different forms.

Eczema is also a form of skin disease constantly met with in gouty individuals, either localized to a few spots in certain parts, as behind the ears, or on the external ear, in the inner side of the thighs, the flexures of the knee or elbow joints, or extremely diffused over the body. As in the case of psoriasis, eczema may precede, accompany, or alternate with articular gout; and in many cases which have come under my notice, it was observed that when the succession of gouty attacks became interrupted for any length of time, there was a development of eczema to an extensive degree. In one case of a gentleman who had experienced several attacks of gout within a short period of time, the articular affection suddenly ceased, but after a few months an eruption of eczema began to show itself first on the ears, then on one elbow, afterwards spreading to the side of the face and other parts of the body: in this instance the skin disease appeared to be made worse by the internal use of arsenical preparations, but yielded to a treatment adapted to the cure of ordinary gouty inflammation.

Acne.—In some few patients the presence of acne seems to be closely connected with the gouty diathesis.

In 1864 a well marked instance came under my care; a gentleman 38 years of age had gout in the left great toe in August, 1861, which was preceded by acne; from that time till December, 1863, the toe was frequently threatened, the acne and articular affection appearing to alternate. At the latter date severe gout came on in the left ankle and great toe, and the skin affection completely vanished. I again saw the patient in 1866; acne had been present in a severe degree for about six weeks, but had disappeared since the redevelopment of gout in the left foot.

In concluding my remarks on the connection of skin diseases with a gouty state of the system, I would state that I believe almost every form of cuticular affection may become developed under certain circumstances, but as yet I do not consider that their true pathology is by any means fully understood, although they are intimately dependent on the impure state of the blood existing in gouty conditions of the habit. The case related by Dr. Graves, to which I referred above, appeared to be one of true gouty inflammation of the skin, and not one of cutaneous disease.

Gout affecting the muscular and nervous systems.—During the progress of regular gout, more especially the chronic varieties, and sometimes without the previous development of the articular disorder, symptoms indicating irritation of the nervous and muscular systems, and clearly referable to the presence of a gouty diathesis, are exhibited. These manifestations are generally of a functional character, but are sometimes dependent on inflammatory action, which appears, as far as can be ascertained, to be of the same nature as true gouty inflammation.

Cramp.—We have already had occasion to notice cramp as a frequent premonitory symptom of a fit of gout, and it is one to which gouty subjects are very liable, not only during an attack, but likewise in the intervals of the paroxysms; and in certain cases this symptom is increased to such an extent as to become a source of serious annoyance. I have observed that cramp is often a very troublesome symptom in gouty cases where there is a notable amount of albumen present in the urine.

Somewhat allied to cramp is a peculiar affection, noticed in certain gouty subjects by Dr. Graves, consisting in an insuperable inclination on the part of the patient to grind his teeth; this desire appears to originate in a disagreeable uneasy sensation in the teeth themselves, and is for the moment alleviated by forcibly grinding them together, but immediately returns when the patient ceases to perform this action, and is therefore continued during the entire day when the disease is confirmed. When asleep, the patient no longer grinds his teeth, the grinding being in all cases the result of voluntary motion. Dr. Graves gives details of four persons so affected, and remarks that, as this grinding continues for years, it produces great changes in the teeth, affecting sometimes one side of the jaw, sometimes both, so that in confirmed cases the teeth are ground down to the level of the gums. Having witnessed many instances of this kind and all of them in persons of the gouty diathesis, he is inclined to attribute the symptom to the existence of gout in the constitution, and its effect on the dental nerves.

The following is an abstract of one of the cases:—

A gentleman, aged 45, slightly made, muscular, and born of healthy parents, was attacked with shivering and loss of power of the left side after a severe wetting. He recovered after a short time, but about a year afterwards he began to observe a tendency to grind his teeth, which gradually increased to a very uncomfortable extent. Under these circumstances he placed himself under the care of an eminent surgeon, who applied the actual cautery behind his ears, slightly affected his system with mercury and extracted one of his teeth, which gave considerable relief for six months. He then became as bad as ever, and applied to another surgeon, who administered preparations of iron without success; subsequently he went to a third practitioner, who used leeching, blistering, pustulation with tartar emetic, and various other remedies, but without any favourable result. About three months afterwards this gentleman dined at the house of a friend, and, with some others, supped late at night and drank whisky-punch. Next day he had vomiting, purging and epigastric tenderness, and, on the day after, the ball of his great toe became swollen, hot, and exquisitely painful, leaving no doubt as to the nature of the affection. In this gentleman's case the grinding of the teeth was not constant, but always greatest when the stomach was most deranged. The teeth in the under jaw were all sound; three or four of the molars of the upper jaw had been extracted. The four upper incisors were ground nearly half way through to the gum on the one side, while the others were very little worn. By pressing the tongue against the upper incisors, or by touching a certain point of one particular tooth, he could at any time arrest the tendency to grind, and suspend it as long as pressure was continued.

From a careful perusal of the cases cited by Dr. Graves, I confess that I am by no means convinced that the peculiar symptom described by him, the grinding of the teeth, was directly dependent on the gouty state of the system, but I should be inclined to look upon it as connected with some form of the dyspepsia.

Neuralgia is not an uncommon manifestation of gout, and may occur in various situations; sometimes the branches of the fifth pair are implicated, and frequently the sciatic nerve, and more rarely other spinal nerves. I have met with many instances of these different forms of neuralgia, which are exceedingly difficult to diagnose, unless they happen to alternate with, or accompany articular gout. Local paralysis appears at times to depend on the same cause, and a case once came under my care of facial paralysis, in which the symptoms disappeared on the occurrence of regular gout, and the patient from that time exhibited only the ordinary features of the disease. In such instances, it becomes a question whether the neuralgia or paralysis is to be regarded as being induced simply by the impure state of the blood, or whether a real inflammatory action is set up in the sheath of the nerves or the fibrous coverings of the spinal cord.

Hysteria and Hypochondriasis.—Sometimes the development of hysterical symptoms is caused by a gouty state of system and becomes relieved by the occurrence of articular gout. Such instances are usually seen in women who strongly inherit gout, especially when there is an irregularity in the catamenia, or soon after the period of their cessation; in such cases it seems to depend on an impure condition of the blood, but there are wanting the exciting causes necessary to bring about an attack of regular gout. I have seen several cases where the spinal tenderness and articular affection clearly alternated with each other. In the male, I have in several instances observed well-marked hypochondriasis, which was obviously connected with the gouty habit, and was relieved by the occurrence of gout in the joints.

In some patients it seems probable that a gouty condition of the uterus or its appendages may be the primary cause of the hysteria.

Headache.—A forcible illustration of the connection between headache and a gouty condition of the system is seen in the following case. A lady, sixty years of age, having enjoyed very good health all her life, consulted me on account of a very intense headache, from which she had suffered about seventeen days; the pain was felt chiefly at the vertex and back of the head, and was somewhat periodic in character, often lasting about an hour, then ceasing for two or three hours, and again returning; however, for the last two days prior to my seeing her, the pain had been continuous. On examination it was found that there was distinct heat and tenderness of the painful part of the scalp. This lady had never experienced any gout, and I at first considered the affection as hysterical, and prescribed accordingly. However, on the next evening the pain suddenly left the head, and the ball of the left great toe became acutely painful and tender, and after a few hours, swollen, red, and shining on the surface; in fact the patient was suffering simply from a severe attack of genuine gout, which ran its ordinary course. A second fit implicating the same joint occurred after a few months, but was not preceded by headache or any other irregular manifestation of gout.

Hemicrania is a symptom by no means infrequently met with in gouty subjects.

Epilepsy, *Apoplexy*, *Mania*, *&c.*—More serious affections of the nervous system occasionally arise, depending on the central portions of the system being involved. Sometimes *epilepsy* appears to be connected with a gouty habit. Van Swieten mentions a case in which the fits ceased as soon as a regular paroxysm of gout ensued, and several instances of the kind have come under my own observation. In one patient, an old man, several epileptic fits occurred before their nature was suspected, but after a time gout became developed in one of the joints, and the head symptoms ceased; prior to the development of the articular affection, an examination of the blood, which I had ordered to be taken from the temples by cupping, showed the existence of a large amount of uric acid.

In another case a gentleman sixty-eight years of age had suffered from regular gout for about twenty years, when an epileptic fit of considerable duration occurred, and in the space of six weeks this was followed by a second fit; but during the subsequent two years and a half there was no return of the fits, but regular articular gout, which had been checked before the occurrence of the epileptic seizure, manifested itself from time to time.

Dr. Robert Wilson has informed me of the following case of much interest in its bearing upon this subject.

A gentleman had suffered from epilepsy from the age of twenty to fifty-two; the fits were frequent, sometimes occurring as often as once a week; he then had distinct articular gout in one great toe, and afterwards experienced attacks of the same kind from time to time up to his death at the age of seventy-two. From the first manifestation of decided gout there was an entire cessation of the epileptic convulsions.

Gouty *mania* is occasionally seen, and one instance in which mania rapidly supervened after the cessation of the joint affection, has been already alluded to in the earlier pages of this chapter.

In another instance, where slight wandering occurred, the course of the affection was interesting, showing clearly that the membranes of the brain were affected with gouty inflammation. The following is a short outline of the case.

A gentleman subjected to great mental and bodily fatigue, and likewise exposed to cold, became ill; his head became hot and painful, and he wandered at night, in addition to which there was considerable febrile disturbance; the cerebral symptoms did not yield to ordinary treatment, but suddenly disappeared, when one of the great toes became affected with acute gout. This patient had previously been subject at long intervals to slight attacks of regular gout, which had been confined to the ball of one or other great toe.

Another patient came under my care suffering from gouty mania, and his case is not devoid of interest. He was over seventy years of age, and had for some lengthened period been subject to articular gout, but of no great severity. Shortly after being chilled from exposure to cold in an open carriage, one wrist became painful and swollen, and continued so for a few days, when the local affection suddenly disappeared, and his behaviour at the same time became altered, and he soon exhibited symptoms of complete mental derangement. This condition of mental disturbance continued for some weeks, but his reason was afterwards completely restored, the inflammation showing itself afresh in the wrist and hand, where it continued obstinately for some time.

In connection with this subject, I may state, that during attacks of epilepsy, paralysis, and apoplexy, in persons not known to have had gout, I have examined the blood and found it to be rich in uric acid; the value of this fact cannot be estimated at present, but must be left to future observations and inquiry.

Are these cerebral affections ever connected with gout, or does the shock caused by sudden mischief to the brain or spine cause defective elimination of the uric acid by the kidneys? At present, I am inclined to regard the latter view as being more probably correct than the former.

Gouty affection of spinal cord.—Instances of the spinal cord being implicated by gouty action have occasionally been noticed, and a well-marked case has come under my own care in a gentleman who suffered from pain and tenderness in the upper part of the lumbar spine, great pain in the legs, and hyperæsthesia, together with extreme depression of the system. During the manifestation of these symptoms, which lasted for some weeks, gout appeared from time to time in moderate intensity in both great toes, and the result of the case, which was most satisfactory, made it probable that it was one of gouty inflammation affecting the meninges of the spinal cord. I have also records of two other cases, in which the spinal structures appeared to be attacked with true gouty inflammation, though in a less degree than in the above instance.

Dr. Graves has also related some cases in which spinal symptoms manifested themselves during life in gouty subjects, and the cord was found softened after death; but, for any evidence that was shown to the contrary, they might have been ordinary cases of softening of the spinal marrow; in one instance, it is stated that some relief was afforded when gout appeared in the feet, but this must not be taken as an absolute proof of its gouty character, seeing that the relief might have been due to the derivative effect of the inflammation in a distant part. As to the appearance of deposits of earthy matter upon the meninges of the brain and cord, and in the sheaths of the nerves, I may state, that in no instance has it been shown that they were in any way connected with gouty inflammation; they probably consisted of phosphate and carbonate of lime, and not of urate of soda, and the former salts never occur as the products of true gout; for when lime salts have been found in gouty concretions they have resulted either from the tissues in which they have occurred, or from ordinary inflammation having been set up around the true gouty deposits.

As in the case of other reputed abnormal forms of gout, so with affections of the brain and spine, we must be extremely cautious in making our diagnosis, and remember that serious organic mischief may occur in the central parts of the nervous system in gouty subjects, and still be essentially independent of the diathesis. The ordinary development of gout is likely to be more or less checked by the occurrence of such structural mischief, and it is also probable that the cerebral affection, when not dependent on a gouty state of the habit, may still be considerably modified by it.

TREATMENT OF IRREGULAR GOUT.

Treatment of Retrocedent Gout.—The treatment of retrocedent gout is simple, and we must be guided in each case by the knowledge we can obtain of its real nature. If the stomach be affected, and there is no evidence of the existence of inflammation, as shown by the want of febrile disturbance, the condition of the tongue, and the absence of tenderness on pressure, then stimulants, as ether, chloroform, ammonia, and aromatics, may be administered, and if the pain be very intense, opium. Vomiting should also be promoted by diluents, and counter-irritation applied over the epigastrium and left hypochondrium. Brandy is sometimes of great use, but it is well not to employ stimulants too liberally, as the symptoms often yield to remedies less likely to be followed by mischief. If there be evidence of an inflammatory state of the stomach, leeches, sedatives, as hydrocyanic acid, and alkalies, are indicated, but such cases are very rare.

At the time we are employing the remedies just enumerated, we should not neglect to pay attention to the extremities, for, by the use of warmth and counter-irritation, we may frequently bring back the inflammation to these parts, and thus relieve the retrocedent affection.

When the heart is the seat of retrocedence, the same stimulant remedies may be applied at the commencement and continued until the depression of the circulation has been removed; when the head is implicated, similar treatment to that which would be adopted in the corresponding affections if they occurred in other subjects, must be resorted to, but somewhat modified by our knowledge of the existence of gout in the system, and of the propriety of endeavouring to cause its return to the extremities.

Treatment of other forms of Irregular Gout.—No simple method can be given for the treatment of the various forms of irregular gout which we have described, as it must necessarily differ much in different cases. Some general rules may, however, be laid down for guidance. In cases in which the heart, lungs, urinary organs, or nervous system are affected, as these are parts of the body of great importance, it should be our endeavour to give relief by inducing gouty inflammation of the extremities, an object best accomplished by the application of warmth and moderate counter-irritation to these parts, as by hot bottles, mustard poultices, and other similar applications.

We should also aim at correcting the gouty diathesis, by the employment of the various remedial means enumerated in connection with the treatment of chronic gout, but at the same time we should carefully avoid producing any depression.

When there is evidence of the presence of inflammation in any important organ, local depletion may be necessary, and the case may be treated as ordinary inflammation; but it should always be borne in mind that a peculiar state of the system is present, which modifies to a great extent the symptoms, and demands peculiar means for its removal.

The value of colchicum in the irregular forms of gout has not been quite satisfactorily ascertained; Sir H. Holland is of opinion that its influence is not limited to the removal of gout from the joints, but extends to the relief of the disease, even when it assumes the most irregular and changeable aspects. My own experience accords completely with that of Holland, as regards the value of colchicum in gouty inflammation of the articular structures, but I have not yet sufficient evidence to enable me to decide to what extent the remedy is useful in removing symptoms which are simply functional, or entirely independent of inflammatory action ; at the same time I am convinced that its judicious employment in most of the irregular manifestations of gout is attended with very considerable advantage.

CHAPTER XV.

DISEASES TO WHICH GOUTY PERSONS ARE PARTICULARLY LIABLE—GRAVEL AND CALCULUS—SCIATICA AND LUMBAGO—PHLEBITIS—KIDNEY DISEASE AND THE SECONDARY CONSEQUENCES OF—DEGENERATION OF THE TISSUES OF THE HEART AND BONES—GOUT AND DIABETES—GOUT AND SCORBUTUS OR TRUE SCURVY—LIABILITY OF GOUTY PATIENTS TO BE AFFECTED BY LEAD—PYÆMIA IN GOUTY SUBJECTS—PROPHYLACTIC TREATMENT OF GOUT—INFLUENCE OF COLONIAL LIFE—PROGNOSIS OF GOUT.

THERE are certain diseases which appear to be closely connected with a gouty state of the system, or the so-called gouty diathesis; among these we may mention, more particularly, certain forms of gravel and calculus, kidney disease, lumbago and sciatica. To this category we may also add phlebitis, to which gouty subjects appear to be peculiarly susceptible. The main object of the present chapter is to describe the peculiarities which these different diseases exhibit when they occur in persons of a gouty habit.

Gravel and Calculus.—We have already shown that the presence of uric acid in the blood is a necessary antecedent to the development of a gouty attack, although other conditions must likewise be present; and also that the gouty and the uric acid diatheses are essentially the same; hence it is natural to suppose that gouty patients would from time to time exhibit symptoms other than those of ordinary gout, resulting from the presence of this acid in the system. The most common of these manifestations arise from the passage of uric acid in the crystalline state or in the form of crystalline or amorphous urates, aggregated so as to form masses of different sizes, and known by the name of sand or gravel and calculi. The voiding of uric sand by gouty patients during some period of their lives, is exceedingly common, and the formation of calculi by no means unfrequent; often, when in early life gravel and calculi are formed, in after years gout is developed. Sydenham himself, it will be remembered, laboured under the combined miseries of gout and calculus, and in explanation of the co-existence of the two diseases, remarks: "Gout produces calculus in the kidneys, a result which may arise either from the patient lying for a long time on his back, or from the secreting organs having so long omitted their functions; or the calculus may itself be a part and parcel of the morbific matter. Be this as it may, the patient is frequently at a loss to know if the stone or gout be the worst disease." Morgagni also observed that calculus of the kidneys was often found in conjunction with gout, and he relates an instance in which both kidneys were distended from the presence of urinary concretions. Scudamore did not think that there existed much connection between gout and calculus, remarking that, in five hundred patients, only five were so afflicted; still, he qualified his statement by saying that in many of these cases he had seen concretions discharged from the urethra of considerable size.

Sir R. Blackmore relates the case of a man who, when he was eased of the stone, was sharply attacked with gout; and, when freed from gout, was grievously, and at last fatally, assaulted by stone.

I have met with numerous instances of the occurrence of gout and calculus in the same individual, but with few in which they were present at the same time; it is not at all uncommon when taking the history of gouty patients to find that when young they had suffered from calculi, and that gout supervenes at a much more advanced age, and we have already referred to the case of a bishop who had the operation of lithotomy performed upon him when a boy, but had not an attack of gout till he was ninety years of age.

Calculi, when they occur in gouty subjects, are usually composed of uric acid or of urates of soda and ammonia, but it is not uncommon to find that oxalate of lime forms either the whole of the calculus or exists in alternate layers with uric acid or urates. Oxalate of lime is also frequently present in the urine of gouty subjects. The existence of oxalate of lime is not to be wondered at, seeing that uric acid is very readily decomposed into oxalic acid. I have proved by repeated observations that oxalates are always present in blood which contains an abnormal amount of uric acid. Oxalic acid is also capable of being obtained from the secretion of the skin of gouty patients.

Lumbago and Sciatica in connection with the gouty diathesis.—Lumbago and, more especially, sciatica are of such frequent occurrence in gouty subjects, that it is as well to speak of them in this chapter, although they might perhaps have been properly classed among the forms of irregular gout. It is of the highest importance in the investigation of these cases clearly to establish their true pathology, as the treatment adopted for one form may have little effect in alleviating another variety; nay, it may even increase it. To make a correct diagnosis it is necessary to ascertain many points in the history of the patient, such as the amount of hereditary predisposition, the habits of life, especially with regard to the character of the alcoholic beverage the patient has been accustomed to take. Our space will not allow us to enter at length into this subject, but we will give the following case as illustrative of the affection when it exists in connection with the gouty diathesis:—

A gentleman, forty years of age, came under my care suffering from sciatica, which, whether originating or not from gout, was evidently kept up by its presence in the system. His father and brother had suffered from gout, and he had himself experienced two or three attacks in the ball of one or other great toe, and also in one ankle; the first attack occurring about six years, the last seven or eight months before I saw him. At the latter date, when gout was still upon him, he was seized with left sciatica, caused probably by exposure to cold; the pain was felt chiefly in the hip and outer side of the leg and instep, not much in the thigh. From that time till I first saw him the sciatica continued, sometimes better, at other times worse, the pains being increased by standing or walking but not notably influenced by alterations of temperature. The urine in the early stages was red and thick but afterwards became pale-coloured and clear: pulse 72: no increased heat of skin.

This patient had been treated for some time without benefit by the ordinary remedies for sciatica, but neither had the diet been attended to nor had the presence of the gouty diathesis been suspected. When however he was placed under a proper regimen, wine and malt liquors being proscribed and the ordinary medicinal treatment of gout adopted, he rapidly lost his painful affection, and was soon restored to health. It is, therefore, evidently a matter of much importance in cases of lumbago and sciatica, and even in other forms of muscular and nervous affections, to ascertain the presence or absence of a gouty diathesis, as the treatment may often be advantageously influenced by such knowledge.

Phlebitis in connection with Gout.—The occasional existence of gouty inflammation of the veins is a fact beyond question, and I think the cases may be grouped in two classes; first, where acute gouty inflammation attacks the veins of a part affected at the time with gouty inflammation; and, secondly, where phlebitis, usually of a much less acute character, ensues without the previous development of gouty inflammation in the neighbourhood of the part. I have met with a considerable number of cases, at least a dozen, of the first class: the phlebitis has been confined to the lower extremities, has been accompanied with the symptoms which are seen in ordinary cases of acute phlebitis, and has been followed by considerable œdema, which has persisted for a long time. In all cases men have been the subjects of this form of phlebitis, a circumstance easily accounted for by the fact that comparatively few women are attacked with acute articular gout. In the spring of 1874 five cases came under my notice, and three of them seemed to be more or less connected with the general election of that year. These patients were suffering from ordinary gout of the feet, and, notwithstanding their unfitness to leave their beds, still less their houses, persisted in going to the poll; this exertion, undergone during the existence of somewhat acute inflammation, appeared to have caused its extension to the veins, and thus produced the phlebitis. In the remaining cases of this class there had been a varicose condition of the legs of long standing.

The second class of cases I have met with in women as well as men; the phlebitis sometimes appears to be hereditary, and Sir James Paget mentions an instance in which a patient, who had himself suffered from phlebitis in successive patches of both saphenous veins during an attack of acute gout, told him, that on the maternal side his mother, two uncles, grandmother, and two cousins had been affected with inflammation of the veins. I have recently seen a case of phlebitis of the popliteal vein in a lady strongly inheriting gout, who had on former occasions suffered from inflammation of the veins, and this was followed by symptoms which indicated partial embolism of one of the divisions of the pulmonary artery. Phlebitis to a very limited extent had existed a few days only when the patient began to walk about, and she was suddenly seized with faintness, extreme shortness of breathing, rapid and very weak pulse, followed after a short time by a peculiar, almost incessant but dry cough, which could not be accounted for by any auscultatory signs. These symptoms, under complete rest, very slowly subsided, but for some weeks the slightest movement in bed caused the breathing to be short and hurried. Sir James Paget relates a case, doubtless of pulmonary embolism, which occurred in a medical man, the phlebitis arising during a severe and protracted attack of gout.

Symptoms in connection with gouty kidney.—The kidneys, as shown in the last chapter, are prone to become contracted in chronic forms of gout, thereby losing much of their excretory power, and hence it follows that secondary disorders commonly resulting from renal insufficiency must necessarily be ranked amongst the sequelæ of gout. One of the most frequent of these is œdema, either confined to the legs or sometimes of a more general kind; effusions into the cavities are likewise found, constituting ascites, hydrothorax or hydropericardium, in some cases depending on a low form of inflammatory action of the serous membranes, but in others simply on passive effusion. Epilepsy, apoplexy, and paralysis, are not unfrequent, and in short, all the secondary results of chronic albuminuria may be observed in some prolonged cases of gout. Many of them, when occurring under such circumstances, are looked upon as instances of *misplaced* gout, but a strict pathology will scarcely allow of their being thus classified, although they are intimately associated with the gouty diathesis.

The long continuance of a depraved condition of blood sometimes leads to fatty degeneration of some of the tissues, and this is frequently observed in the heart, and may prove the cause of a fatal termination. It is also seen in the osseous tissue, and I have found the ends of the bones, in extreme cases, very brittle, and containing a large quantity of oleaginous matter.

Gout and Diabetes.—In the course of practice I have seen several cases in which gouty patients have become affected with saccharine diabetes or glycosuria, and it may be a matter of some interest to examine the influence exerted by the one disease upon the other. In glycosuria the watery excretion from the system by the kidneys usually becomes much augmented, and there can be little doubt (seeing that the kidney structure is not much implicated) that the solids of the urine are then freely eliminated; accordingly one would suppose that the uric acid would not be able to accumulate in the blood, which would therefore, as far as that element is concerned, be kept in a state of purity, so that the gouty condition would be lessened. That such is the case I have had abundance of evidence. In several instances of patients who had for many years been the subjects of periodic gouty attacks, the supervention of diabetes has entirely prevented its occurrence: and in others it has lengthened the intervals very considerably. In cases in which gout has continued there has been usually an absence of any great augmentation of the urinary secretion, although it may have been highly impregnated with sugar, and in such cases the uric acid may not have been completely thrown out.

In illustration of the relation between gout and diabetes I will only mention here one case. A gentleman about 60 years old had had at first yearly, then half yearly attacks of gout in the feet for about twelve years: diabetes then suddenly came on, and for more than four years he remained quite free from all gouty symptoms; the diabetes was afterwards checked, the specific gravity of the urine being reduced from 1·041 to 1·021, and soon afterwards slight gout followed on an attack of bronchitis. I might quote several other cases bearing on the same fact.

I have known several instances of patients previously suffering from gravel and calculi, who have lost all traces of these ailments on the supervention of diabetes; an exchange of a lesser for a greater evil.

Gout and Scorbutus or true Scurvy.—The occurrence of scorbutus or true scurvy is very rare in London, and in fact throughout the whole of this country, with the exception of the time of the potato famine. Few practitioners who are not connected with merchant ships have had any opportunities of watching the disease; still less likely is it to be seen in conjunction with other diseases. A few years since the late Dr. Christian called me in to see an elderly gentleman, who had from time to time been subject to gout in the feet and knees; the attack for which I was consulted had differed much from the earlier ones. There was, it is true, at first the ordinary redness, swellings, heat, and pain of one great toe and the knee of the same side; but after a few days, when the joints were expected to assume a healthy appearance, they were found to become of a livid colour, which gradually increased, until at last some fear was felt both by patient and doctor that gangrene was supervening, and my opinion was sought. Having seen many cases of scorbutus, I strongly suspected the peculiar appearance of the foot and knee to be due to true scurvy; there was the peculiar brawny condition of the parts, due to the adhesion of the skin to the subcutaneous tissues, besides the dark purplish state of the skin and the rigidity of the knee joint. The state of the gums, which were spongy and bleeding, fully confirmed the view I had taken.

On inquiry I found that for the last six months he had rigorously avoided all fruit and vegetables, on account of indigestion, from which he suffered, and this at once accounted for the occurrence of scorbutus, which manifested itself chiefly in the parts previously implicated in the gouty attack.

By an appropriate diet with the free use of oranges and vegetables, the patient rapidly lost all the symptoms and became, in fact, quite well.

This is the only case of gout and scurvy existing together that I have met with, but it was one in which I found my previous knowledge of the phenomena of scorbutus very valuable.

Liability of gouty patients to be affected by lead.—In our chapter on the etiology of Gout we dwelt somewhat at length on the effect of lead impregnation, and showed that workmen who were kept long under the influence of the metal, as painters, plumbers, and others, were more liable to be attacked with gout if they indulged only moderately in alcoholic liquors, than other workmen not so circumstanced; this was proved clearly by the statistics obtained from hospital practice, for it was found that from 25 to 30 per cent. of gouty patients in these institutions had previously been affected either with lead colic or paralysis, or at least exhibited very strongly the characteristic blue lead line upon the gums. That lead has an influence in inducing gout was also rendered probable by the results of some observations in which it was shown that the administration of the salts of this metal diminished in a notable degree the excretion of uric acid by the kidneys.

As it was found that lead certainly acts as a predisposing cause of gout, it occurred to me that the converse might also hold good; viz., that individuals either subject to or strongly inheriting gout, are more readily influenced by the metal than others. On investigating the subject I discovered that gouty patients were very prone to exhibit the blue line on the gums, and that they were prone to suffer from colicy pains and great constipation when even small quantities of lead salts were given them, and soon afterwards a remarkable case came under my care, which seemed to confirm my reasoning.

I was sent for to see a lady about forty-two years of age, a long distance from town, and found her in bed in the following state: both wrists a little tender; there was great want of power of the whole upper extremities, and some wasting of the flexor muscles of the thumbs, and of the muscles of both arms and forearms. On inquiry, I found that in the spring she had had gout, at first in the great toes, lasting but a short time, but she had never been quite well; the abdomen had been affected with a kind of colic; after a time she was sent to

Buxton, and became better, but on her return she had gout again and then colic; these symptoms alternated until the beginning of December, when I was called in. Before seeing the patient I had washed my hands, and had been struck with the softness of the water, and after an examination lasting for a few minutes, I suspected that she was suffering to some extent from lead poisoning; I looked at the gums, and the blue line was strongly marked, and this, coupled with the above symptoms in the upper extremities and abdomen, made it almost certain that my suspicion was correct. I found that the water which the patient drank was rain water, that it ran down from the top of the house, which was rather a new built one, and was collected in leaden pipes which were alternately full of water and dry, it then passed through a filter and thence into the boiler. On making a careful examination of some of the water sent to town I detected the presence of lead to a considerable amount, by evaporation and subsequent testing with sulphuretted hydrogen and iodide of potassium. I was given to understand that all in the house had partaken of the same water, yet only this lady had been appreciably affected by it; and hence we must conclude that there was some peculiar susceptibility in her case, probably depending on her gouty diathesis.

This lady's brother, living in quite a different part of England, was poisoned by drinking water within a few weeks of his sister's illness, and exhibited symptoms of saturnine colic and paralysis, showing the peculiar susceptibility of both members of the family to the influence of lead. Rather more than two years afterwards I had an opportunity of seeing this patient at my own house; she had continued well till two months before her visit, when the left ankle became swollen and painful, and the right foot, especially the great toe; these symptoms had continued more or less up to the time of her visit; the blue line on the gums had entirely disappeared; it was important to ascertain the state of the kidneys, and the urine passed on going to bed had a specific gravity, 1010, pale in colour, slightly but distinctly albuminous, and containing a mere trace of uric acid. The early morning's urine had the same weight, the albumen was rather less in amount. The urine of 24 hours was found to be 62 fluid ounces, with a specific gravity of 1010, pale yellow and clear; the quantity of uric acid was very minute, under a grain; the urea amounted to 263 grains.

Pyæmia in gouty subjects and Pyæmia simulating Gout.—There is a disease which I have met with in subjects who had previously suffered from gout, and also in other patients, and as in both cases it has given me some difficulty in its diagnosis, I think it would be well to speak of it here. I allude to certain forms of pyæmia. I was once called to see, with Dr. Prance, a young man, who had for a day or two suffered from an affection of one great toe. When I saw him the ball of that toe was intensely swollen, hot, and of a purplish red colour; no other joints were implicated. At first I thought that it was a first attack of gout of a very severe character, and this idea was strengthened by ascertaining that he had for some months led a very dissolute life, and had drunk wine and spirits to a very considerable extent. On further examination, however, I was led to doubt the correctness of my first mental diagnosis, as I found the temperature of the body far higher than in simple acute gout, besides which there was a something about the patient which indicated a very great disturbance of the nervous system.

At our consultation next day all doubt was removed, for at the head of the tibia and other parts large purplish red tumours had appeared, and matter was evidently contained both in them and in the metatarso-phalangeal articulation of the great toe. The patient did not live long, and, before death, exhibited many purulent swellings.

The second case, one which is fraught with interest, came under my care in the hospital in December, 1867. The man was 59 years of age, and his occupation that of a fire-engineer. About twelve days before his admission he had had a blow on the left cheek, a little below the eye, and soon after this had become somewhat febrile with shiverings and twitchings, especially of the muscles of the trunk; there had been slight paralysis of the left side of the face, and some alteration in the speech since the blow. It was found that he had for twelve years at least been subject to periodic attacks of gout in the great toes, about once a year or so. On admission he complained of pains in the head of a throbbing character; he perspired rather freely, temperature 101·4° Fahr., pulse 82. After two days it was found that the ball of the left great toe was hot, swollen, and tender, and he complained of much pain in the joint; but his temperature had fallen to 99·2° Fahr., and the pulse to 68; the headache was still present, and there was some starting in his sleep, and a little dulness of his intellect. The urine was turbid with urates, but free from albumen. After another two days the right great toe was inflamed, and the next day the right knee. The side of the face which had been injured was also somewhat swollen, with a slight blush. I ordered three ounces of blood to be taken from the arm for the purpose of chemical examination. About this time I gave a clinical lecture on the case, and of course went carefully into the diagnosis.

Notwithstanding the great toe and knee affection, and that the patient had for many previous years been a gouty subject, I came to the conclusion at this stage of the case that it was not one of gout, and I was much strengthened in this opinion by finding that the blood serum gave no trace of uric acid; I also was inclined to think that it was one of pyæmia; partly from the symptoms exhibited, namely, the twitchings and previous shiverings, together with the dulness of the intellect; and partly also from seeing a possible source of purulent matter in the injury the man had received on the cheek. The further progress of the case showed the correctness of the diagnosis. In the course of a few days the patient complained of pain in the calf of the left leg, which soon exhibited some hardness, and became very tender. Again, a few days afterwards, the inner sides of both ankles were red and œdematous, and over the upper part of the left tibia just below the knee the same appearance was seen; he became delirious also, the tongue was dry and brown, and the temperature rose steadily to 104°. The next day considerable puffiness was found on each side of the left patella, and the whole knee joint soon became red and enlarged from effusion.

The man died in the course of a few days, with all the symptoms commonly found in the last stage of pyæmia. At the post-mortem examination the points of interest were as follows: In both great toes the cartilaginous surfaces of the metatarso-phalangeal joint were sprinkled with urate deposits, and these were the only joints that had been affected by gout; each joint contained some pus. The left knee joint was also filled with pus, as was the swelling at the head of the tibia.

In other respects the body was that of a well nourished man.

As gout is apt to lead to the production of some maladies, so it has been supposed that its presence is opposed to the occurrence of other diseases, and it has been asserted that gout and phthisis stand in this antagonistic relation to each other. The reason why these disorders are not frequently met with in the same individual is not difficult to explain, seeing that gout is a disease of middle and advanced life, whereas phthisis is more frequently met with in young people. A few cases of their co-existence, however, have come under my care, and in none of them could I detect that the former disease exerted any controlling power over the latter. In two instances, one of a young, the other of a middle-aged man, phthisis ran a rapid course, although gout was in each case so far developed as to have caused the production of extensive chalk-stones.

PROPHYLACTIC TREATMENT OF GOUT.

The discussion of the prophylactic treatment of gout need not be dwelt upon at length, as we have already anticipated much in detailing the treatment of chronic gout; a few words, however, may not be out of place.

If an individual be subject to biennial or annual fits of gout, or even more frequent paroxysms, and the general health is otherwise good, great attention to diet combined with active regular exercise will generally prevent a progressive frequency in the recurrence of the disease, and sometimes even prolong the intervals. In cases in which the time of the fit may be calculated with tolerable accuracy, I believe much may be effected by a rigorous attention to diet a little before the expected return, and by having recourse for a time to the use of properly chosen salines as previously described, the selection being made to suit the peculiarities of each case.

A course of mineral waters acts in a similar manner to the medicinal administration of salines, and possesses the advantage of being generally accompanied with change of air and scenery, and absence from the cares of business; but on the other hand, it has its disadvantages, as it cannot be long persevered in, is not always taken at the most desirable period of the year, and is often attended with many serious inconveniences, from which the other plan of treatment is exempt.

It has been asserted that colchicum, given before the expected visitations, exerts a beneficial influence in warding them off, and Sir Henry Holland relates an instance in which he gave it daily in moderate doses in combination with quinine, for two years, not only with entire exemption from gout, but with singular benefit to the general health, when previously to this treatment scarcely two months passed over without an attack. In certain cases colchicum may be advantageously so prescribed, but I should feel more disposed in the majority of cases to trust either to simple salines, or salines combined with an aromatic bitter if the digestive organs are much impaired; such a treatment when judiciously carried out is never followed by injurious results, and in many cases has proved so successful as to have allowed the patient even to indulge in wine, without being tormented by his enemy.

Complete abstinence from wines and malt liquors is often sufficient to prevent the repetition of the attacks of gout, but in many cases, if the patient has been accustomed to take wine freely, it is important to find a substitute for it; this may generally be done by ordering a limited quantity of some distilled spirit, as brandy or whisky, in order to keep up the tone both of the digestive organs and of the circulating system.

The following case is one of many which have come under my care illustrative of the influence of abstaining from wine upon the return of the gouty paroxysms :—

A gentleman, fifty-seven years of age, who inherited gout from his father, and who had himself lived freely, experienced his first attack of gout, which proved very prolonged and severe, but was confined to the ball of one great toe. He continued his former habits and a second attack returned within a month. After this he discontinued his wine (he had been accustomed to take about a bottle of port wine a-day), and since that time, now two years, he has not experienced any symptom of gout, although he has not taken any medicine.

I have seen many cases even more striking than the above; but as medicine has usually been given at the same time that the wine has been omitted, the absence of gout may have been partly due to the influence of the drugs.

Recently I have watched the effect of the total abstinence from all alcoholic fluids in gouty cases, and have been well satisfied with the result in the majority of the cases; in some, however, there appeared to be a necessity for a small amount to keep up the activity of the various functions.

INFLUENCE OF COLONIAL LIFE ON GOUT.

Within the last few years I have had under my care several gouty patients who have lived a considerable time in the Colonies, and have been much struck with certain features which the disease in these subjects has exhibited. I have notes of at least half a dozen such cases; in all of them the great peculiarity has been the amount of anchylosis of some of the larger joints, more especially of the ankles and knees, which has arisen from the very extensive deposits which have taken place around these joints; in some this deposit has subsequently become softened, and large urate abcesses have been formed.

I am inclined to attribute this condition partly to the very free and irregular living which many colonists are apt to indulge in, and partly to the inclemencies of the weather to which they are so frequently exposed. Most of these patients have lived in Australia.

PROGNOSIS OF GOUT.

When a patient, otherwise in good health, is suffering from a fit of regular gout, however severe it may be, the prognosis, as far as the attack is concerned, may be considered favourable. I have never known or heard of an instance which terminated fatally. It was a popular belief until a very recent period, that the appearance of gout was rather to be desired than not; that, in fact, an attack of gout possessed the power of curing every other ailment and of freeing the system from any lurking malady. I have no hesitation in affirming that such is not the case, and I cannot too strongly deprecate the treatment occasionally pursued, of endeavouring to nduce an attack of gout for such an ideal purpose. At the present time, I believe, there are few who would venture upon such an assertion, but still it is occasionally made.

Gout has a decided tendency to shorten life, and insurance companies, being fully aware of the fact, are not backward in acting upon it by increasing the amount of premium for the insurance of the lives of those who have suffered from this disease. It is difficult to discover any reliable statistics as to the effect of gout in shortening life, and the rules at different insurance offices as to the increase of premium differ considerably.

At one office, for example, I am informed that no particular rate is adopted for gouty persons, but the additional rate is regulated according to the report of their own physician and that of the medical officers to the company. At a second office I am told that eleven per cent. is added to the premium, whatever may be the condition of the patient as to gout, provided he is not too much affected to pass the physician; and at a third office I am assured that from two to three years are added to the lives, according to the report of the medical officer.

When once a patient has experienced a fit of gout, he is liable to its recurrence; the interval may indeed be prolonged, as we have already seen, even to many years, by great care and attention, but still, except under peculiar circumstances, a return of the disease may be expected.

In looking over the histories of the cases which have come within my own knowledge, I can find but comparatively few exceptions to this rule. An interval of two years, or even more, often occurs between the first and second attack; this is soon, however, reduced to one year, then to a half-year, and so on, as the malady becomes more and more grafted into the constitution These remarks apply to such patients as take no care to prevent its return. If proper precautions be adopted, and an appropriate plan devised and followed out, a very different course may be given to the disease, even when it has acquired some considerable hold upon the system.

The following are a few exceptions to the above rule as to the progress of gout which I have met with :—

A gentleman, who lived to the age of seventy, had an attack of gout in the ball of the left great toe when thirty-five years of age. From the latter date up to the time of his death he was accustomed to live well, and to partake freely of port wine, but he had had no return of the affection; he died suddenly of cardiac disease or aneurism.

Another gentleman, twenty years of age, a medical student, in the spring of the year was attacked about two o'clock in the morning with excruciating pain in the ball of the great toe. This lasted five or six hours, and left the part so swollen and tender that he was unable to resume his studies for six days. Thirteen years after this he had an attack in the ankle, apparently brought on by over-walking and taking some stout. After a further period of more than twenty-one years he had had no return, but had occasionally felt darting pains through the joints of the great toe.

This gentleman's father had gout for the first time at sixty-eight years of age, the year in which he died.

Gouty patients sometimes live to a good old age, and occasionally, in the latter part of their lives, the fits become milder and less frequent. A few years since I met with an example of this in a gentleman, then about eighty-four, who had suffered from gout for fifty years. No chalk-stones were visible, and his general health throughout life had been remarkably good; during the ten years previous to my seeing him, although he still suffered occasionally from gout, the fits had become much less frequent and of a milder character. On the other hand, I have met with instances in which gout has continued to recur pretty frequently even up to the age of eighty-nine; in all of such cases there were extensive chalky deposits.

After repeated attacks, when gout assumes an asthenic and chronic character, and more especially when any crippling of the joints occurs, or when deposits become visible at the surface, it will generally be found that the kidneys have lost much of their power of throwing out uric acid and the urine often contains a trace of albumen, the blood at the same time being loaded with urates; in these cases the prognosis is much less favourable, for though such patients may live many years under favourable circumstances, still they are liable to be seriously affected by intercurrent disease, severe accidents, and other agencies, which in healthy subjects would be unattended with dangerous consequences.

The following examples illustrate what we have advanced as to the prognosis of gout:—

A gentleman about fifty-four years of age, inheriting gout very strongly, himself suffered from the disease early in life, and before the age of thirty-five had noticed chalk-stones, and was soon crippled, both in the hands and feet, from many of the smaller joints becoming anchylosed. One autumn, when at the seaside, he was exposed to cold, and in lieu of experiencing the ordinary symptoms of catarrh, rapidly sank, apparently from prostration of the vital powers. The urine of this patient was very pale: it now and then exhibited a minute quantity of albumen, but scarcely a trace of uric acid.

Another example occurred in a tall and robust man, who had suffered from gout for many years, and had concretions about the extremities, as well as several nodules upon the ears; after a severe accident, which caused fracture of the thigh, although he progressed favourably for a few days he died suddenly and without apparent cause. At the *post mortem* examination I discovered the kidneys to be very small and contracted, and weighing only two and a half ounces each; the tubuli of the pyramidal portion contained white streaks of urate of soda, and the organ presented an appearance resembling that shown in Plate III., fig. 4.

In the chapters on morbid anatomy other examples will be found, proving the liability of gouty subjects to be suddenly cut off by comparatively slight accidents; it is probable that the fatal termination in such cases is dependent on the state of the kidneys, which can but imperfectly perform their function under ordinary circumstances, but are quite unable to do so when an increased demand is made upon them.

That even slight injuries are accompanied with a considerable waste of tissue and the necessity for increased elimination, I have proved by the examination of the urine of a patient under the effect of a large blistered surface. The amount of the solid excretion of the urine was found almost double, compared with what it had been for some time previously, and this increased elimination of solid matter was accompanied with a considerable diminution in the weight of the body; it is probable that an increased waste of tissue takes place likewise after severe injuries, or during febrile disturbance from any other cause, demanding a healthy condition of the kidneys in order to keep the blood pure.

Besides being affected by acute disease and accidents, patients with impaired kidneys are liable to the occasional supervention of that form of gout which has been named retrocedent, and such metastatic action, whether to the heart, stomach, or brain, may be attended with much danger; moreover, in chronic gout, the blood remains impure even in the interval of the attacks, giving rise in many cases to constant dyspepsia, and hence, indirectly, tending to an imperfect nutrition of the body, a condition of habit which may be termed gouty cachexia, and may lead to the production of organic disease in various important organs.

From what has now been advanced, it will be evident that the examination of the urine for the purpose of ascertaining how far the function of the kidneys has become implicated, is of much value as an aid to the prognosis in many cases of gout. In making such examination I not only determine the presence or absence of albumen, but usually obtain some idea of the manner in which the solid portions of the urine, and especially the uric acid, are excreted; in some instances even a quantitative estimation of the uric acid is desirable.

In concluding my remarks upon this subject I may state, that I consider even a single fit of gout, however slight, should be looked upon as an intimation that the patient cannot go on with impunity in his present habits of life; it is a warning that either he must change them or expect returns of the disease, which as time advances are certain to increase both in frequency and duration, and are likely to embitter and shorten existence.

On the other hand I am equally persuaded that, if proper regimenal and medicinal precautions be taken, the gouty patient may be saved from such an alternative, and the disease, instead of increasing in severity, may be gradually mitigated, and probably interfere but little with the comforts of life.

ON RHEUMATIC GOUT:

ITS

NATURE AND TREATMENT.

CHAPTER XVI.

RHEUMATIC GOUT:—REMARKS ON THE USE OF THE NAME—CONFUSION ARISING FROM THE EMPLOYMENT OF THE TERM—DIFFERENT DISEASES INCLUDED UNDER THE HEAD OF RHEUMATIC GOUT—CASES TO WHICH THE TITLE IS GIVEN—SEPARATION OF GOUT FROM RHEUMATISM—RHEUMATOID ARTHRITIS—HISTORY AND DEFINITION—DESCRIPTION—NODOSITIES OF FINGERS—MORBID ANATOMY OF RHEUMATOID ARTHRITIS—CONDITION OF BLOOD, ETC.—CAUSES—IRREGULAR FORMS OF RHEUMATOID ARTHRITIS—RHEUMATOID ARTHRITIS IN CONNECTION WITH OTHER DISEASES—PATHOLOGY.

THE term rheumatic gout is applied to many different diseases, so that it is often exceedingly difficult to define what is intended to be understood by it. The compound name naturally implies that the disorder itself is complex, and depends on a union of the two separate diseases, gout and rheumatism. The name is often employed under this supposition, but in many works on medicine the same term is used to designate a disease which is considered by the writers to differ altogether from either of these affections, as far as its intimate pathology is concerned.

Under these circumstances it will be necessary to discuss somewhat fully the diseases which have been thus confounded, and to point out a method of clearly distinguishing them. But few authors recognise the combination of gout and rheumatism, and many are strongly opposed to the doctrine of such a union; no mention of it is made in the works of Boerhaave, Van Swieten, Cullen, or Heberden. Scudamore remarks in reference to this subject, that textures which have been long affected with gout become so weakened as to be very susceptible of vicissitudes of temperature, and thus the disorder may partake of the character of rheumatism; it was only in this way that he could attach any propriety to the very common expression, *rheumatic gout.* It would appear from the above that the term is often employed, but seldom attempted to be accurately defined.

Our first aim in the present chapter will be to state succinctly the diagnostic character of gout and rheumatism both in their acute and chronic forms, and afterwards to describe certain other diseases which have been called at different times and by different authors by the name of rheumatic gout. To make a correct diagnosis of these disorders, so frequently mistaken for each other, is of great moment, as they generally call for a distinctive treatment.

Acute gout cannot easily be mistaken for acute rheumatism when these maladies are exhibited in their typical forms; the subjects in which the diseases usually manifest themselves differ considerably, the former being most commonly seen in men after middle age, and in those who have lived freely; the latter is at least as frequent in females, and very commonly met with in young women of enfeebled powers. The characters of the two diseases are also dissimilar; gout, as we have already seen, in its early seizures ordinarily affects but one or two joints, and commonly the ball of the great toe, and the inflammation, although accompanied with comparatively little fever, is attended with much local pain and œdema, and subsequent desquamation of the cuticle; the attacks are for the most part periodic, and gradually implicate a larger number of joints. Rheumatism, on the contrary, generally affects many joints, even at first, and the large ones especially, and those of the upper extremities equally with the lower; the fever is also often out of proportion to the local inflammation, and although rheumatism is apt to return upon re-exposure to its exciting causes, still no periodicity can be traced in its visitations. In rheumatism there is a great tendency to the occurrence of acute inflammation of the heart, which is not the case in true gout. The two diseases may be further separated by the study of their various predisposing and exciting causes. Notwithstanding the apparent facility in the diagnosis of typical cases, there are some very difficult to separate; we have already given instances of such in our description of acute gout.

In gout we have proved beyond question that the blood is invariably impregnated with uric acid, and we are in a position equally to prove that in genuine rheumatism this principle is absent, for in an examination of forty cases of the latter disease exhibiting all its typical peculiarities, no such condition could be discovered.

Furthermore, we have demonstrated that true gouty inflammation is always accompanied with the deposition of urate of soda in the structures primarily inflamed; but an examination of the joints of numerous subjects who had suffered during life from acute rheumatism has convinced me that no such alteration ensues in the latter disease.

The former of these means of distinguishing gout from rheumatism can often be made available for clinical purposes either by an examination of the blood or blister serum, the latter can of course only be of service in pathological investigations. It must be remembered that these methods of diagnosis are positive only as regards gout, but negative as regards rheumatism, for the absence of the above named phenomena will in no way separate rheumatism from other diseases with which it is sometimes confounded.

In the chronic stage of the diseases, the separation of gout and rheumatism by the ordinary symptoms which present themselves becomes in some instances a difficult task, even to those who have given special attention to the subject; the forms most apt to be mistaken are chronic gout affecting both the large and small joints and unaccompanied with any external deposits or chalk stones, and certain forms of sub-acute rheumatism where the same structures are implicated; the external phenomena are then almost the same, probably but little febrile disturbance is present, the joints are but slightly swollen, and there is no redness of surface.

A careful investigation of the history of the cases will do much: if it be found that the disease originally commenced in the great toe, and gradually became more extended in after attacks; if it began about the middle age, or bordering upon this, and the patient had lived freely, indulging in wine or malt liquors; then it is in all probability a case of gout. In many subjects the examination of the external ear will throw considerable light upon the case, and I have often been able to arrive quickly at a correct diagnosis by finding the presence of a spot or two upon the helix. Plate I. fig 1 *a*, represents the ear of a patient who had only one external deposit, and the true nature of his disease was first discovered by observing this fact. Instances occasionally occur in which the history, from peculiar circumstances, is of little value, in some cases it cannot be procured, and sometimes there are no external signs on which a diagnosis can be founded; these cases are indeed rare, but any one frequently consulted on such subjects must now and then have felt the difficulty. In some of these cases I have derived much assistance from an examination of the blood or blister fluid, and a careful attention directed to the effects of drugs has often afforded much additional aid, from the fact that gout is relieved by the administration of colchicum in an infinitely more decided manner than rheumatism.

October, 1862. An interesting example illustrating the difficulties of making a diagnosis in certain cases of joint disease, and the great advantage derived from the examination of the serum, was once under my care in the hospital.

A man, O. H., aged forty-nine, a German, has lived in England five years; by occupation a musician, often playing in the streets at watering places.

His father died of phthisis, his paternal grandfather was subject to gout.

During the latter part of this season, when at Ramsgate, the weather was stormy, and the patient was often exposed to wet for hours together.

One day he suffered from great coldness of his fingers and toes, which, however, soon became red, painful, hot, and very tender, and this state continued without improvement till his entry into the hospital, a period of about ten days.

When admitted his condition was as follows:—

The middle finger of the right hand was very painful and swollen, next to this the forefinger of the left hand; this he attributed to the fact of his having carried heavy music-books when his fingers were quite numbed, the chief weight resting upon these fingers. The great toe of the left foot, and the dorsum of the right one were also much swollen and painful, and the pains were greatly increased at night; the tongue was much furred, and there was loss of appetite and some thirst. Pulse 68.

The case certainly presented points of considerable difficulty in its diagnosis; cold appeared to be the exciting cause; he had, it is true, usually drunk a little porter each day, but denied having been accustomed ever to take it in excess; it must be remembered that until some time after his admission it was not known that his grandfather had suffered from gout. I was inclined on my first visit to look upon the case as one of acute rheumatoid arthritis, or possibly of sub-acute rheumatism affecting the smaller articulations; still I had my suspicion of its gouty character, and with the view of solving the difficulty, I had a very small amount of blood taken from the arm. The serum of this blood, when examined by the thread experiment, gave evidence of containing a very large amount of uric acid, the threads being completely studded with crystals; the examination at once threw a light on the case, and led to its more complete investigation, and the full knowledge of its intimate nature. At first the patient was ordered camphor julep three times a day, and continued it for six days, at the end of which time the condition of the joints was much the same as on admission. Half a drachm of colchicum wine was then added to the draught, and after a day or so he was markedly relieved by it, and soon became well.

A more searching investigation showed the presence of two very small nodules under the fold of the helix of the left ear, and also of a few points of the same matter near the end of the left index finger, and covered only by a thin cuticle. These deposits were found to be crystalline, and to consist of urate of soda.

Having shown how gout may be separated from rheumatism, the question arises, can they coexist, and is there a disease to which the term *rheumatic gout* can properly be applied? For my own part, although I am far from denying the possibility of acute rheumatism attacking either an individual predisposed to gout, or one who has already suffered from visitations of that disorder, or, on the other hand, of gout supervening where rheumatism has previously existed, still I am convinced, after a long and careful study of the subject, that no combination of the two diseases, as assumed by the title, is ever seen in nature. In my own practice, I have found the name rheumatic gout applied to many diverse maladies, sometimes to true gout, when it has travelled above the knees, and more especially when it has implicated the upper extremities; for example, a patient will frequently speak of himself as formerly having been subject to gout, but subsequently to rheumatic gout; although the disease has throughout its course steadily and characteristically progressed, and has remained as typical a case of gout as on the day when he first felt the twinges of the great toe. Sometimes the term is applied to sub-acute rheumatism, more especially when not commencing with rheumatic fever; but the name rheumatic gout is more commonly given, particularly by the medical profession, to a disease having a peculiar pathology of its own, and in no way related either to gout or rheumatism; the nature and symptoms of which we shall now consider.

I should mention that now and then, especially when the large joints are alone implicated, gout is mistaken for rheumatism, and a careful perusal of Dr. Macleod's

Lectures has convinced me that some of the cases included by him under the term capsular rheumatism are merely examples of gout. Macleod almost admitted this himself when he stated that the external phenomena are often very similar, the morbid appearances the same, and colchicum the specific remedy. If the details of the lectures be attentively examined and analysed, much reason will be found to doubt altogether the existence of a special disease entitled to the name of capsular rheumatism, for it will be seen that many different disorders besides genuine gout are there recorded, as, for example, affections connected with urethral discharge, and cases of purulent inflammation of the joints.

RHEUMATOID ARTHRITIS.

Synonyms.—CHRONIC RHEUMATIC ARTHRITIS, RHEUMATIC GOUT, NODOSITY OF THE JOINTS, CRIPPLING ARTHRITIS, RHUMATISME NOUEUX, USURE DES CARTILAGES ARTICULAIRES, ARTHRITE SÈCHE, ARTHRITE DEFORMANTE, RHUMATISME ARTICULAIRE CHRONIQUE PRIMITIF, ETC.

History and Definition of.—This affection is distinctly pointed out by Heberden, who speaks of an articular disease, not commencing in the great toe, but preferring other joints, and in its progress differing so much from gout, and also from rheumatism, that it should be distinguished from both by some peculiar name. Heberden remarks that in this disease, though the pain is much less violent, the swelling is greater than in gout, and its peculiarity chiefly consists in the great and lasting feebleness which it engenders, causing the limbs to be more weakened in two years than they would be by regular gout in twenty.

The same disease is designated *Nodosity of the joints* by Haygarth, and considered to differ both from gout and rheumatism, and by Cruveilhier *Usure des cartilages articulaires*, and Dr. Adams of Dublin, who has carefully studied its morbid anatomy, proposed the name *chronic rheumatic arthritis;* the other synonyms, as rhumatisme noueux, arthrite sèche, arthrite deformante, rhumatisme articulaire chronique primitif, have been given to the disease by different French authors.

Sometimes the affection has received a name dependent on its situation, for example, rheumatic gout, when the wrists, hands, and feet are affected; chronic rheumatism, when it shows itself in the shoulder, elbow, or knee, either singly or simultaneously; and *morbus coxæ senilis*, when located in the hip.

Dr. Haygarth was fully alive to the importance of giving to this form of arthritis a distinct name, but the term nodosity of the joints hardly expresses what is intended to be conveyed, as a nodose condition may be produced by many causes: chronic rheumatic arthritis is preferable as a name to rheumatic gout, for although the disease under consideration differs much from true rheumatism in its pathology, still it is sometimes excited by it, and at times resembles it in its symptoms.

The late Dr. Fuller described it under the name of rheumatic gout, although he allowed that it differs considerably from both affections, for he says, "Rheumatic gout is not a mere variety of gout or of rheumatism nor is it a compound of the two diseases; it is essentially distinct from them both, has a special pathology of its own, and requires a distinctive title."

If we agree to name a disease simply from its external characters, then I admit that the term rheumatic gout is not inappropriate; but if we advance further, and have regard to its more intimate pathology, then I deny the propriety of the name; acting upon the former principle, we should be equally justified in calling some cases of scarlatina or measles by the compound name of rubeolo-scarlatina, and we know that these diseases were not separated from each other two centuries ago; but we are now convinced that, although one may sometimes present many of the characters of the other, yet in their real nature they altogether differ, each being dependent on the presence of a specific poison.

Although unwilling to add to the number of names, I cannot help expressing a desire that one may be found for the disease under consideration, not implying any necessary relation to gout or rheumatism. Shortly before the first edition of the present work was published, about 1858, I proposed the term *Rheumatoid Arthritis*, by which name I wish to imply an inflammatory affection of the joints, not unlike rheumatism in some of its characters, but differing materially from it in its pathology.

Description of.—I propose giving a sketch of the affection as I have myself witnessed it, pointing out any differences in the experience of others, when such are important.

Rheumatoid arthritis is met with in the young and old, among rich and poor, and in both sexes. Dr. Adams considers that in males the hip joint is most affected, in females the wrists and hands, and that it is most commonly found among the labouring poor; but, on the other hand, Sir B. Brodie thought that it is most common in the upper classes of society; a difference of opinion probably explicable by a difference in the class of patients more prominently brought under each surgeon's notice.

The affection, as far as my own experience enables me to form an opinion, more frequently occurs in individuals who have been exposed to the influence of powerfully depressing causes, either mental or physical, but when it is excited by severe cold or acute rheumatism, such predisposing causes may not be met with in so marked a degree. I must remark, however, that I have met with many cases in which the patient was apparently in good health, and the disease has arisen without any assignable cause.

Rheumatoid arthritis may be studied in three forms, the acute, chronic, and irregular, the second of which may be subdivided into the general and localized varieties. The acute form is the rarest, as the disease usually assumes a chronic character from the first. In the localized variety sometimes one joint only is affected, sometimes a set of joints, as the extreme articulations of the fingers.

In *acute* rheumatoid arthritis several joints are usually attacked, the swelling is considerable, there is a distinct rise of temperature of the affected parts, with pain, tenderness, and redness. There is also some constitutional disturbance, as thirst, loss of appetite, a moderate elevation of temperature of the body seldom exceeding 101° Fahr., heat of skin, and other evidence of febrile disturbance. The points of difference between acute rheumatoid arthritis and rheumatic fever consist in the absence of the profuse sweatings, and of the disposition to inflammation of the external and internal membranes of the heart, so common in acute rheumatism; as likewise of the tendency of the inflammation to wander from joint to joint.

The following is a typical case of the disease :—

A lady, forty-two years of age, when living in Australia in the bush, was confined, and being unable to procure a good supply of cow's milk, was induced to nurse her child for a period of twenty months; at the same time she had herself but a very deficient amount of meat, and, in consequence, was reduced to a very weak state. After a short time she noticed that some of her joints became affected; at first the knees, then the ankles, afterwards the elbows and wrists, and lastly, many of the small articulations of the fingers. These parts were swollen, painful, hot, and tender, but the local symptoms were never intense, nor was the constitutional disturbance very great, that is, there was no high degree of febrile disturbance. After a few weeks some of the joints were much injured; the knees, although reduced in size from the absorption of the fluid, could neither be fully extended nor flexed, and the patient was soon unable to stand by reason of their rigid condition: the movement of several of the other joints was also limited, although in a less degree. The causes of debility being after a short time removed, the patient rapidly gained flesh and strength, and the tendency to the joint disease passed off, but not without having inflicted irremovable injury.

In *chronic* rheumatoid arthritis the most prominent symptoms are, pain in the joints, attended at first with little or no swelling, sometimes increased at night and by heat; any attempt to move an affected joint augments the pain, particularly if it has been at rest, and patients are frequently quite unable from this cause to stir in bed on first waking; after a short time the joints enlarge from the increased secretion of fluid in the articular cavities, which is usually capable of detection by its imparting a soft and fluctuating sensation to the touch; at a later stage of the disease, absorption of the fluid usually takes place, and the swollen joints become gradually smaller and harder.

There is little or no accompanying fever, and at times scarcely any constitutional disturbance; but in the majority of cases there are signs of considerable impairment of the general health, a condition of more or less anæmia or leucocythæmia; often there is marked dyspepsia and the exhibition of nervous symptoms of a low type. In some instances the larger joints, as the knees, ankles, wrists, and elbows, are peculiarly selected, in others the smaller articulations only are attacked, but frequently both large and small joints indifferently. Although this form of arthritis is migratory, affecting joint after joint, yet when it has once invaded them, it seldom leaves any free from mischief.

The disease, if unchecked, travels over the whole body, implicating almost every articulation, and causing much deformity and distortion from the enlargements and contractions which it produces; nor are its ravages confined to the limbs alone, but other joints may be attacked, especially the temporo-maxillary articulation, causing the closing of the jaw; the upper cervical vertebræ may likewise be involved, and the neck become fixed; and thus at last the patient is rendered crippled and altogether miserably helpless during the remainder of life. A case illustrating the disease when both the jaw and neck are affected will be found near the end of this chapter.

Plate IV. fig. 1, represents the hand of a woman, in whom the disease was just commencing; it will be observed that several of the smaller articulations are much swollen from the presence of fluid in the cavities. The first phalangeal joint of the ring finger exhibits the phenomena in a well-marked form; some distention of the wrist joint will also be noticed, depending on the same cause.

Plate VI. figs. 1 and 2, represent the hand and foot of a child only four years old, who had been for some months suffering from rheumatoid arthritis.

Fig. 26 represents the hand of another patient, the drawing being taken from a plaster cast; the peculiarity

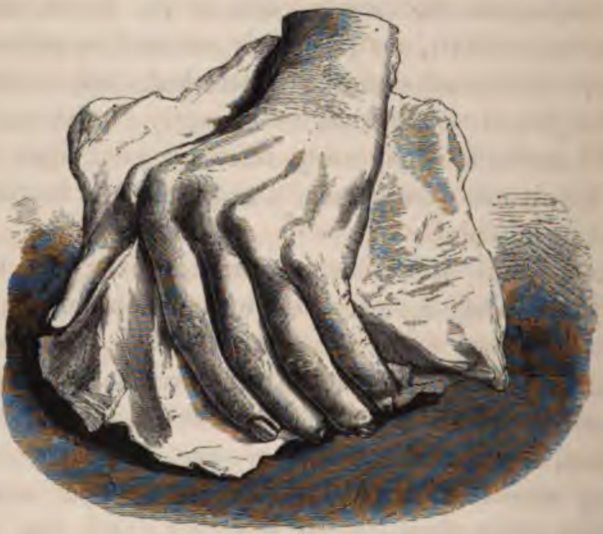

Fig. 26.*

of the deformity, the twisting outwards of the fingers, is produced by serious injury of the smaller articulations.

Plate IV. figs. 2 and 3, represent the hands of a patient in which the disease is much advanced, and in which the peculiar distortions so common in these parts are well illustrated.

In the chronic localized variety the hip-joint is especially liable to be affected, the disease producing the peculiar alterations in the muscular structures as well as in the joint itself which are so fully discussed in works on surgery. Besides the hip the shoulder or some other large articulation may be alone affected.

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* Fig. 26. A drawing from a plaster cast of a hand much distorted from rheumatoid arthritis.

A still more chronic form of the disease, principally affecting the smaller joints, and especially the last phalanges of the hand, is frequently met with and known as *nodosities of the fingers.* Heberden has a small chapter on the subject in his Commentaries, entitled *Digitorum nodi*, and consisting of the following query :—

" What are those little hard knobs, about the size of a pea, which are frequently seen upon the fingers, particularly a little below the top, near the joint? They have no connection with the gout, being found in persons who never had it ; they continue for life ; and being hardly ever attended with pain, or disposed to become sores, are rather unsightly than inconvenient, though they must be some little hindrance to the free use of the fingers."

Dr. Begbie thinks the nodules are connected with gout, or at least that they are only met with in patients having a gouty diathesis, but he allows that they are often found in those subjects who have never experienced a fit of gout, and that they possess none of the peculiarities of composition which are found in true gouty chalk-stones.

I believe Heberden's assertion that they have no necessary connection with genuine gout to be correct, and they are certainly found in other subjects than those of a gouty diathesis. I have noticed that several members of the same family are frequently affected with them, but as far as my own experience goes, I have very seldom seen them in patients who were sufferers from true gout. It must be remembered that I completely separate the nodules from genuine gouty depositions which so frequently occur about the fingers, but which can generally be distinguished. The *digitorum nodi* of Heberden are produced by the arthritic disease under consideration, but modified by its attacking only the last phalanges of the fingers. When the disease has advanced to some extent, anchylosis, more or less complete, ensues, the ends of the bones are enlarged, and all the surrounding structures become thickened and indurated. This form of the affection frequently troubles elderly people, and is often attended with some disease of the hip or other large joint. Fig. 27 represents a hand in which the ends of several of the fingers are altered in the manner just described, and some of the joints flexed and immovable. This form of the disease is often unaccompanied with pain, at least to any inconvenient amount, but there is frequently some tenderness when pressure is used upon the swollen joint.

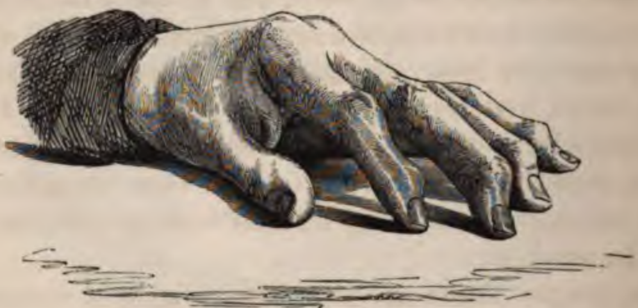

Fig. 27.*

I have notes of some hundreds of cases of this affection, and although the disease, in this form, only produces inconvenience, still it is often a source of great mental disquietude, especially to ladies.

Although these protuberances never give exit to chalky

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[*] Fig. 27. Hand of a lady, with nodules and distortions induced by rheumatoid arthritis; she was suffering from a chronic affection of one hip joint of a similar nature.

matter, yet in a few cases I have known them to discharge a slightly yellow transparent viscous substance, about the consistence of the white of egg. This has generally been after they have been punctured by the patient.

The following case illustrates well this form of disease when confined to the extreme joints of the fingers:—

A gentleman, aged 48, who had lived in many climes, both hot and cold, came under my notice in 1868. His general health was fairly good, but about five or six months previously to my seeing him he had noticed pain in the little finger of each hand, and marked swellings of the extreme joints. Although he considered himself pretty well, yet a few years before he had suffered from necrosis of the jaw, and a portion had been removed. This necrosis appears to have arisen from the action of mercury, for he had been severely salivated during an African fever.

Besides the finger affection, he had lately experienced pain in the shoulders. The pulse was rather small, 72; his extremities were not cold, and he was not thinner than usual. I lost sight of him for four years, and he had done little in the way of treatment. There had been a great advance in the nodose state of the extreme joints of the fingers, and instead of the disease being confined to the little fingers, it had spread to all the fingers and thumbs, but implicated only the extreme joints. Many of the joints were very much swollen, and some of them tender, with a certain amount of anchylosis. Recently he has again come under my care, now eight years since I first saw him, and as far as I can compare his present state with that of four years since, I do not think any amount of change has taken place. During the last few years he has persevered fairly regularly with the treatment I have from time to time prescribed, and I feel sure has derived much advantage from it; his general health is now excellent.

I have quite recently seen another case illustrative of the same facts as the above, and also showing in a very marked manner the complete symmetry which this disease often exhibits.

1876. A gentleman, 74 years old, has enjoyed moderately good health, but has always been weakly; he believes he was a seven months' child. For the last few years he has noticed a slow alteration going on in some of the fingers, and at present his hands present the following appearances. The extreme joint of each middle finger is considerably enlarged, stiff, and tender; the same joint of the left little finger is also swollen, and within the last month or so the same change has been taking place in the corresponding joint of the right little finger; all the other joints are healthy.

Many other cases have come under my notice in which the affection was confined to the extreme phalangeal joints of the fingers, and in some instances it has occurred in two or more members of the same family, generally in females after they had passed middle-life, and sometimes when they have reached old age.

Dr. Charcot, in his annotations to the 2nd edition of the present work, has given the following summary of the different forms of this disease, the substance of which I cannot do better than introduce in this place. He divides rheumatoid arthritis into three groups:—

1. *Rhumatisme articulaire chronique primitif, généralisé ou progressif;* the *rhumatisme noueux* of authors.—The cases in this group are chiefly distinguished by the tendency of the disease to become general; the small joints of the extremities, those of the hands for example,

and especially the metacarpo-phalangeal joints, are symmetrically affected, and during the progress of the disease most of the other articulations are successively attacked in a definite order, and for the most part irreparably injured.

2. *Rhumatisme articulaire chronique primitif, fixe ou partiel.*—In these cases the disease usually remains localised in one or two of the larger joints, producing deep-seated mischief; sometimes called *arthrite sèche,* or morbus coxæ senilis; hip-joint disease.

3. *Nodosités d'Heberden,* called Digitorum nodi; usually classed among gouty affections, and confined either to the extreme joints of the fingers or the next row; commonly leaving free the metacarpo-phalangeal articulations, which in the first group of cases are attacked earliest and most severely. These three types pass into each other by insensible transitions, and frequently the characteristic peculiarities of all of them are united in one subject, the differences depending more on the local manifestations than on any essential pathological distinction.

MORBID ANATOMY OF RHEUMATOID ARTHRITIS.

The morbid anatomy of rheumatoid arthritic disease has been carefully studied by several pathologists, and among them Dr. R. Adams of Dublin should be particularly mentioned; it will be my object to give in a small compass a summary of the principal results which have been arrived at.

If a joint be examined in the earlier stages of the disease, when swelling is prominent, a considerable amount of synovial fluid is found, and the joint exhibits the same appearances as in cases of ordinary inflammation; the lining membrane is often red from over-injection of the blood vessels. It is not an easy matter to obtain an opportunity of examining the joints in this early stage, as the disease is free from danger to life, except in its advanced stages; the supervention of other maladies sometimes, however, gives the means of doing so.

In no stage of this disease are deposits of urate of soda found, and I am fully persuaded that the statements which have been occasionally made to the contrary are erroneous. It is not impossible that a patient may have had gout in a joint which may afterwards become the seat of rheumatoid arthritis; but this is most rare, and, if it ever occurs, it does not in any way favour the idea that the deposition of urate of soda is an attendant of this form of inflammation. When the effusion in a joint has become absorbed, the capsular membrane is left much thickened. The internal structures—as the round ligament in the hip-joint, the tendon of the biceps in the shoulder—become destroyed and are sometimes entirely removed. When the disease has been present in a joint for a long time, the articular cartilages are absorbed, and in some very old standing cases even the inter-articular cartilages; this is occasionally seen in the knee-joint, also in the wrist, and the lower jaw. From the amount of the distension caused by the fluid in the early stages the different ligaments become elongated, and being slow in recovering their natural state, the joints are rendered mobile and more subject to dislocation.

Foreign bodies of varying size and consistence are of frequent occurrence; sometimes these are cartilaginous, sometimes bony, and they are connected with the structures of the joint by ligamentous bands; vascular excrescences are likewise common.

When the articular cartilages have been completely removed, their place is supplied by an ivory-like enamel, remarkable for its polish and hardness; in some joints this eburnation covers the entire end of the bone, in others it occurs in streaks or patches in the direction of the movement of the joints. It appears to result from the denuded surfaces becoming partly worn away, and a smooth enamel being formed by the mutual action of the bones on each other: around the articular surfaces, thus acted upon, bony vegetations often arise.

If the head of a diseased bone is sawn through, it is often found to be of an unusually spongy consistence and contains a large amount of oily matter, arising from the occurrence of a species of fatty degeneration.

In most joints, after the fluid has become absorbed, a crepitus is felt on movement, from the rough surfaces grating against each other.

Mr. Canton has called attention to the fact that many of these anatomical changes, which are usually ascribed to the effects of old age or accident, are really the consequences of rheumatoid arthritis; these remarks apply more particularly to the changes in the ossicles of the ears, the distortion of the joints of the feet, some forms of hip joint disease, and also to an affection of the shoulder joint, accompanied with rupture of the bicipital tendon.

The following is a description of the changes which were exhibited by the hand of a male patient who had suffered from rheumatoid arthritis, and died under my charge in the hospital from some acute disease. The hand much resembled that depicted in fig. 26.

As regards the general appearance of the hand, the anterior extremities of the metacarpal bones are broad and prominent and overhang the phalanges; to the touch they are nodular, as if from a number of small tuberous outgrowths.

The phalanges are turned obliquely outwards; the first row are placed nearly at a right angle, cannot be extended, but can be flexed to some little extent; they appear as if dislocated on to the palmar aspect of the metacarpal bones. No grating is felt in the metacarpo-phalangeal joints when these bones are moved in any direction.

The second row are bent backwards at various angles to the first; they have a direction more outwards than the first row, and seem displaced on to the dorsal surface of the latter bones. Some overlap the others, *e.g.*, in the right hand the bone of the second finger overlaps that of the third, and the third that of the fourth; the little finger, however, does not turn so much outwards as the others, and in the left hand the bone of the third finger overlaps that of the fourth.

The third row of bones follows the same direction as the last, and the articulations do not appear to be diseased.

Only the metacarpo-phalangeal joint of either index finger is affected, and all the joints of the thumbs are perfectly normal.

On removing the skin from the right hand, the more distorted one, the extensor tendons of the fingers are seen, instead of passing over the metacarpo-phalangeal joints, to be pushed aside into the spaces between them, apparently by the enlargement of the ends of the metacarpal bones, the tendons being on the outer side of the fingers on which they act. The flexor tendons appear to be contracted, they are displaced to the outer side of both the metacarpo-phalangeal joints, and the joints between the first and second phalanges.

In the metacarpo-phalangeal articulation the lateral ligaments are stretched and lax; the anterior ligament is thickened, as also are the other fibrous structures around, which help to form the capsule of the joint. On opening the joint not a vestige of a synovial membrane is seen, and the articular cartilages have disappeared, except a very small portion on each bone. The articular surface of the metacarpal bone has lost its rounded form; the upper part is expanded and presents numerous small nodular projections, as also does the anterior portion. Laterally the bone is absorbed and has a rough and worm-eaten appearance. On the under part (palmar aspect of the bone) and rather to the outer side is a small surface, the upper third of which is covered with a layer of cartilage, the lower two-thirds with smooth compact bone; this is the only portion which has the appearance of a normal articular surface. The articular surface of the first phalanx is much shallower than natural, is roughened, and only small pieces of the cartilage here and there remain.

A section of cartilage, from the end of the metacarpal bone, under the microscope shows patches in which the cells are lost, and their place supplied by a confused mass of very imperfectly formed fibres, decussating with one another in all directions; these patches are abruptly defined. The cells in the neighbourhood are increased to about four times the size of those found in other parts of the cartilage; they are more glistening and their nuclei are not visible; the cells at some distance are much scattered, though somewhat grouped, have no determined arrangement, and are embedded in a finely granular matrix; the cells are oval, angular, and elongated; the nucleus is mostly single, sometimes double; irregular in shape and sometimes containing nucleoli. The granules of the matrix have a somewhat linear arrangement, giving the idea of fibres.

In the parts undergoing calcification it appears that the earthy matter is deposited in the enlarged cells, for, on the addition of acetic acid, the earthy matter is dissolved, leaving the cells visible.

In the articulation between the first and second phalanx the ligaments, and all the fibrous structures round, are much thickened. On opening the joint the articular surfaces of the bones are found to be entirely destroyed. The end of the first phalanx has been absorbed on the dorsal and palmar surfaces, so that the bone, instead of being pulley-shaped, is wedge-shaped; both surfaces present numerous little projections, which are composed of fibrous tissue. The end of the second phalanx is flattened obliquely from the dorsal to the palmar surface and covered with little projections. Between the opposed surfaces of these bones, and uniting them together, are numerous small bands, composed also of well formed fibrous tissue. The extremities of both bones are surrounded by a great number of little bony projections.

The following are the principal points of interest as far as refers to the disease under consideration, which the post mortem examination of a case of rheumatoid arthritis implicating the jaw-bones, detailed at page 520, revealed.

In the right knee joint the synovial membrane was found thickened, and appeared to have undergone some gelatinous degeneration: the semi-lunar cartilages had entirely disappeared. The articular cartilages were ulcerated and removed from the bone, especially in lines corresponding with the fringes of the synovial membrane; the irregularity of the surface thus produced gave rise to a feeling of crepitation on any movement of the joints during life. When the head of the tibia was sawn through the interior structure was found to be soft and

Pl. VI.

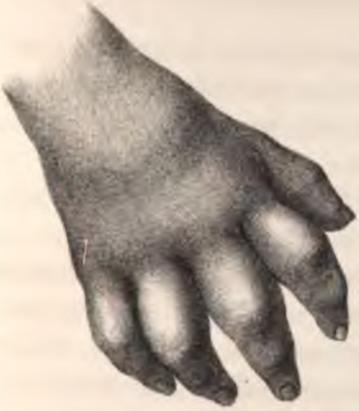


Fig. 1.

Fig. 2.

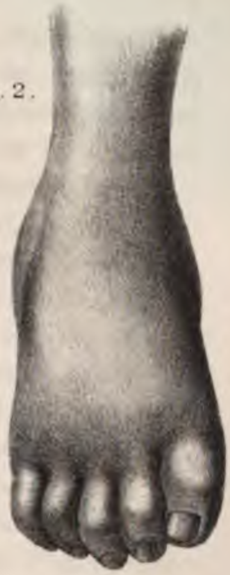


Fig. 3.

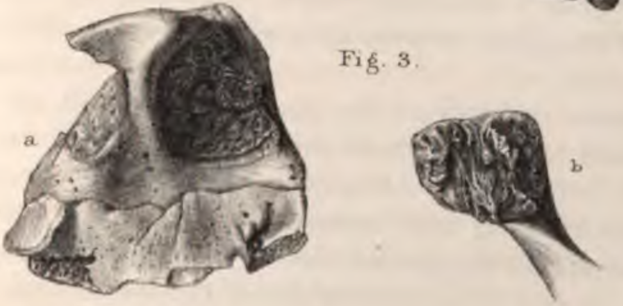
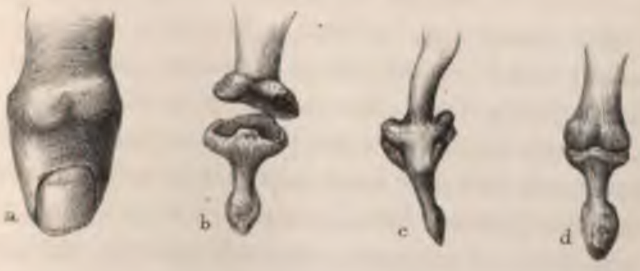


Fig. 4.



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the exterior shell of compact tissue was very thin. The left temporo-maxillary articulation was next examined; it was anchylosed, and after the removal of the ligaments it was found that the anchylosis was due to a union similar to a suture formed by the interlocking of outgrowths of the bones which enter into the formation of the joint. The interarticular fibro-cartilage had become entirely absorbed, as had likewise the articular cartilage of the temporal and maxillary bones; no other joints were examined. These appearances are seen depicted in Plate VI., fig. 3, *a*, *b*. The kidneys were large, each weighing six and a half ounces. The lungs contained many tubercles, and cavities were seen at both apices.

In fig. 4 of the same plate the alterations in the ends of the phalangeal bones which occur when the fingers are especially affected (Digitorum nodi), are well depicted.

In Dr. Adams' work there will be found a complete account of the changes which take place in the various joints of the body in rheumatoid arthritis, and Mr. Jonathan Hutchinson has given some good drawings showing the absorption of the cartilages in this disease, in his Illustrations of Clinical Surgery.

CONDITION OF THE BLOOD, ETC., IN RHEUMATOID ARTHRITIS.

I have made several analyses of the blood in this disease.

The clot has exhibited a healthy appearance, only a slight buff from excess of fibrine in the acute forms. The serum has been of the normal specific gravity, and has not shown the presence of urate of soda or uric acid.

Several analyses of the urine have failed to detect any peculiar morbid state in uncomplicated cases of rheumatoid arthritis; at times the urine gives rise to a somewhat copious urate sediment, more especially if the symptoms are at all acute; often on the other hand the urine is clear. Sometimes albumen is present, not, however, as a result of the disease in question, but rather of the depressed state of system so often seen in connection with it.

There is nothing peculiar in the perspiration either as to quantity or quality.

CAUSES OF RHEUMATOID ARTHRITIS.

The causes of rheumatoid arthritis may be divided into two classes, the predisposing and the exciting causes.

1. *The predisposing* causes may be subdivided into, first, those dependent on the individual; secondly, those which result from external influences.

a. Influences dependent on the individual.

Hereditary tendency.—This does not appear to exert any very special influence; for in looking over the histories of numerous cases, I fail to find much evidence of its action; if it exists at all, it is much less powerful than in gout. We often find one member of a large family suffering severely from this disease and the others entirely free from it. Dr. Charcot considers that in forty-one cases he found a hereditary predisposition well marked in eleven.

Sex.—It is often asserted that women are more liable to rheumatoid arthritis than men. Drs. Charcot and Trousseau hold this opinion very strongly. Doubtless there are reasons, depending on irregularities of the uterine function, which make women more predisposed than men. I have, however, found that men are very subject to the disease, and some of the most severe cases I have met with have been in the male sex.

Age.—Rheumatoid arthritis may occur at any age; the more acute and general forms usually occur in the young, the more limited varieties, such as the hip joint affection and the nodosities of the fingers, in more advanced life. I have seen the disease commence at about three years of age in a child whose hand and foot are depicted in Plate VI., figs. 1 and 2, and I have also known cases in which no symptoms were exhibited till the patients were nearly eighty years of age. Dr. Charcot has also seen two cases in which the patients were four and six years old respectively.

b. Influences independent of the individual.

Debility.—Everything which causes debility and loss of tone in the circulation acts as a predisposing cause. Hemorrhage is a very frequent cause; hence the disease is not uncommon in cases of menorrhagia, but any other form of bleeding is equally powerful. It not unfrequently arises from rapid child-bearing, or from too prolonged lactation.

Prolonged mental anxiety likewise powerfully predisposes to the disease, especially if, as is often the case, it is combined with night watching. I have known many instances where rheumatoid arthritis has followed, in daughters, the nursing of parents during a long illness.

That the sudden production of debility will occasionally give rise to it I have had many proofs, especially among women after severe hemorrhage and rapid child-bearing. Rheumatoid arthritis also occurs in young females labouring under catamenial irregularity, but it appears to me questionable whether any special stress can fairly be laid upon the uterine disturbance. The occurrence of the joint affection appears to be more dependent upon the accompanying depraved condition of the general system, and in numerous cases of the disease I have found the catamenial function perfectly regular. In many instances, however, rheumatoid arthritis arises without any very evident cause, but generally in patients having naturally a weak circulation, even though accompanied with fulness of habit.

Alcoholic beverages.—I have as yet failed to see any proof that rheumatoid arthritis is induced by the taking of fermented liquors. Those who have for years been total abstainers suffer from the disease equally with those who have indulged in malt liquors, wines, or distilled spirits.

2. *Exciting causes.*—Rheumatoid arthritis is not unfrequently excited by the same causes which lead to acute rheumatism, more especially by cold and moisture. It appears to be occasionally induced by the occurrence of acute rheumatism, which seems, in certain cases, to cause the joints to take on this particular form of action; but an error is apt to occur in our estimation of this influence, inasmuch as it is probable that rheumatoid arthritis, when it assumes a more than usually severe character, is apt to simulate, and be mistaken for, rheumatic fever. I have known several cases exhibiting all the characters of rheumatoid arthritis, apparently arising from that form of rheumatism which is connected with urethral inflammation, and this was the case with the patient, the dissection of whose hands is described above.

IRREGULAR FORMS OF RHEUMATOID ARTHRITIS.

Eye affection.—Occasionally we find other parts than the joints affected with rheumatoid arthritis, and the most common manifestations of the irregular forms are seen in the eyes and ears. When the eyes become implicated, the disease generally assumes the form of sclerotitis, iritis, and conjunctivitis; frequently these are combined. I am of opinion that many, perhaps the majority of the cases of the so-called rheumatic inflammation of the eye, when not connected with urethral affection, are of the nature of the disease under consideration; but it must not be forgotten that the tissues of the eye are often affected, both by true gouty and rheumatic inflammation.

The following case is an illustration of rheumatoid arthritis, both of the joints and eye, but slight in character and readily amenable to remedial treatment:

August, 1862.—A lady, forty-seven years of age, possibly inheriting the affection from her maternal grandmother, came under my care, having suffered from the following anomalous symptoms. About ten months since she had noticed that one eye suddenly became affected with redness, accompanied with some irritation; this lasted altogether about four days; since that time, with the exception of one interval of six weeks, the same eye-symptoms have returned about each twenty-one days.

Many months since—in fact, long before the eye affection—this lady had experienced pain in some of the finger-joints, and at the time of her first visit several of the phalangeal articulations were somewhat swollen and tender. The general health had usually been good, but of late she had flagged somewhat, and when first seen the circulation was decidedly feeble, the pulse small and quick, the extremities cold, and she was easily tired by excitement. Depressing causes, and especially damp, appeared to cause an increase of all the symptoms. Under the influence of iron and quinine, and afterwards of iron and cod-liver oil, this patient soon became greatly relieved, the eye attacks very much less frequent, the circulation much improved, the fingers decidedly better, in fact, almost well, and this was accompanied with a marked increase of flesh.

Another and much more severe case occurred in a patient under my care in the hospital. The following is her history:—

July, 1862.—A woman, R. W., aged thirty-four, married, with two children; none of her family have suffered from gout or rheumatism. About three years since she first was troubled with pain and stiffness in the joints of the toes and ankles, which prevented her going about her usual occupations. A few weeks afterwards she noticed that her shoulders and hands were painful, and she has continued to suffer more or less in these different joints. About ten months ago she appeared to have had some inflammatory affection of the lungs, and put herself under homœopathic treatment; she became very weak, and during that time her joints became much deformed and contracted; her eyes also were inflamed, and she almost entirely lost the use of her sight. They afterwards improved greatly, but she has never seen well since. Three months ago the pain in her limbs returned, and she was then admitted into the hospital, her condition being as follows:—

The right wrist is much stiffened, and painful when attempted to be flexed or extended; both hands much deformed, the right more than the left; the metacarpo-phalangeal joints of the right hand are flexed and incapable of extension beyond a few degrees, and some grating sound is heard on movement. Several of the phalangeal joints are more or less stiffened, some permanently flexed, and considerable grating is heard in the joints of the thumbs. The metacarpo-phalangeal joints of the left hand are flexed, and the phalangeal joints are but partially movable. The left knee is considerably swollen, and some slight fluctuation is felt, but the chief part of the enlargement appears due to the thickening of the tissues. There is much stiffness of the neck, and the patient is incapable of turning the head many degrees; there is also tenderness about the seventh cervical and first dorsal vertebræ. The eye had remained in the same condition ever since the first attack; the vessels of the sclerotic coat are dilated and turgid, giving a blood-red appearance to the eyes; the pupils are very large, and but little affected by light; the patient can discern objects, but the vision is extremely indistinct.

Affections of the ear.—The internal structures of the ear occasionally undergo changes of a similar character to those which occur in other parts in rheumatoid arthritis; the ossicles become anchylosed and deafness ensues, but as yet little is known with certainty about the subject.

Affection of the larynx.—I have met with several instances in which the larynx appeared to be distinctly attacked by rheumatoid arthritis, producing great alteration in the voice and at times complete aphonia and difficulty in swallowing; these cases have been too frequent to allow me to think that the relation was accidental. I have never had an opportunity of making a post-mortem examination of any such case, but am inclined to think that the arytenoid cartilages were the structures implicated.

Among the cases of this disease related in the next chapter, one will be found in which the symptoms referable to the larynx are well developed. Alterations of the arytenoid cartilages would lead to more or less complete anchylosis of the articulations, and would account for the occurrence of the symptoms.

Rheumatoid Arthritis affecting the jaw and neck.—It has already been stated that rheumatoid arthritis often attacks the jaw, and my own experience convinces me that it has a peculiar tendency to select the temporo-maxillary articulation.

In my notes of cases of this disease, I constantly find it stated that there has been stiffness of the jaw, even to a very uncomfortable extent, but in the majority of cases it passes off, either without special treatment or when counter-irritation has been applied on the joint. This, however, is not always the case, and I have seen several patients in whom one or both articulations have become more or less permanently stiffened, preventing the opening of the mouth to the full extent, and five instances in which the jaw has become completely locked, so that food could only be introduced into the mouth through an aperture left by the absence of a tooth. In one of these I had the opportunity of examining the temporo-maxillary joints after death, and as the case is one illustrating several points of considerable interest in the pathology of the disease, I will give a short sketch of it from my hospital book.

J. B., aged 26, a carpenter and joiner, admitted February, 1864. From his account it appeared that his father has some joint affection, and there was no history of diabetes in his family. He himself had been healthy until within 18 months of his admission. After working with his feet in water for some days, and otherwise exposed to cold, he was seized with pain in the joints.

At first the knees were affected, then the ankles, afterwards the shoulders, elbows, wrists, and fingers; many of these joints were swollen, and all painful; the neck also became stiff, and he soon noticed a difficulty in mastication, from the painful state of the temporo-maxillary joints on the left side. He was sent to the Bath Hospital for three months, and had to keep his bed for six weeks, after which he was just able to get about with crutches; about this time a cataract slowly formed in the left eye. About five months after the commencement of the joint disease, his attention was drawn to the frequency of micturition, before that he had lost flesh to some extent, but afterwards emaciated rapidly and grew extremely weak: his appetite became ravenous and thirst excessive, the skin harsh and dry and the bowels very costive, with hard actions; an eruption occurred in spots on the thighs.

During the next three months most of the symptoms increased, and the amount of urine passed in the twenty-four hours reached sixteen pints; after this, for the next six months, up to his coming into the hospital, many of the symptoms had slightly abated. On admission he was extremely weak and emaciated, the spines of the vertebræ being very prominent, the whole shape of the scapular and iliac bones being distinctly seen, and the limbs appeared to be little more than bones covered with skin. The jaw was so little movable that the tongue could not be protruded more than half an inch; the spine was somewhat turned and could not be straightened; the hands, more especially the left, were much distorted in the manner shown in Plate IV., figs. 2 and 3, nearly all the thumb and finger joints were swollen, particularly the metacarpo-phalangeal joints of the index and middle fingers. The wrists were slightly tender, as also the elbows, which could not be straightened, and the shoulders were stiff and painful.

On examining the lower limbs it was found that the hips were stiff and painful, the knees and ankles swollen and distorted. An eruption of psoriasis in oval patches was seen over the thighs; the left eye was completely blind, the sight of the other very defective. The urine had a specific gravity of 1·044, and the quantity in twenty-four hours amounted to 160 fluid ounces. Bowels confined.

The patient lived about four and a half months after his admission into the hospital, and died at last from phthisis and general exhaustion; the urine gradually becoming less in quantity and the weight decreasing till it became as low as 1·013, and the sugar being scarcely detectible. The points of most interest in the post-mortem examination are given under the morbid anatomy of this disease.

RHEUMATOID ARTHRITIS IN CONNECTION WITH OTHER DISEASES.

Rheumatoid arthritis is so often associated with skin disease, that it is desirable to dwell a little upon their connection. The cutaneous eruptions which are most frequently met with are psoriasis, prurigo, and eczema.

Psoriasis.—I have seen a very large number of cases in which psoriasis has been present at the same time that the joints have been implicated; sometimes it precedes, sometimes it follows the development of the articular affection; sometimes, on the other hand, the two alternate with one another, or, at any rate, when one increases in intensity the other diminishes. The following cases illustrate these points.

1869.—A gentleman, aged 67, came under my care for some affection of the right hip joint, of two or three months' standing, causing him to walk lamely; there was considerable difficulty in crossing the left over the right knee, and, in fact, he exhibited all the symptoms of rheumatoid inflammation of the joint, with some wasting of the left thigh; there was a threatening of the joints of the hands and feet.

For some years this patient had been troubled with psoriasis; there were large patches on the knees and thighs, but the cutaneous disease had lately been in considerable abeyance.

By treatment, continued for a few months, the hip joint affection, to my astonishment, I confess, became much better and afterwards quite well, but from time to time, for three or four years, one or other joint gave a little trouble.

Treatment of a tonic character, as the iodide of iron and arseniate of iron, appeared to act most beneficially in relieving both joint and skin annoyance.

1872. The second case I shall relate is that of a gentleman aged 57, whose father had suffered from hip affection, and whose mother had been rheumatic. He had himself been troubled with psoriasis for ten years, and for more than a year had had gradually increasing swelling of the right knee, which was somewhat tender and painful, and rendered him very lame; the movements of the joints, both in flexion and extension, were considerably impaired.

By treatment with iodide and arseniate of iron, both the knee and skin became much improved; but during the next spring, after having omitted medicine for some time, the eruption of psoriasis again increased, and there was some return of knee affection, both of which again yielded to treatment. From that time up to the present, when there has been any marked return of the skin disease or of the knee trouble, a return to a similar treatment has been followed by marked relief.

Prurigo.—Several cases of rheumatoid arthritis limited to the smaller joints, more especially of the hands, and accompanied with a pruriginous affection, have come under my notice, and at the present time I have a patient with this complication who assures me that when the skin is most troublesome the joints of the hands are decidedly better, and when the joints become painful and more swollen he is free from the intense irritation of the skin.

Eczema.—Some few cases of eczema with rheumatoid arthritis have come under my notice, but, from my present experience, I am inclined to think that psoriasis more frequently accompanies this disease, while eczema more commonly co-exists with gout.

Heart disease in connection with Rheumatoid Arthritis.—I have never met with an instance in which I could trace the occurrence of pericarditis or endocarditis to rheumatoid arthritic disease, however acute the joint affection may have been; and I am of opinion that this absence of cardiac inflammation is one of the best tests for distinguishing this malady from genuine rheumatism. Cases it is true have been related which at first sight appeared to militate against this view, but probably if they were more fully investigated it would be found that the cardiac affection had arisen independently of the disease under consideration. Dr. Charcot, as a result of his own clinical experience, in conjunction with that of other French physicians, comes to the conclusion that inflammatory affections of the heart, such as endocarditis and pericarditis, are associated with the forms of the present disease, classed under *rhumatisme articulaire chronique généralisé* (see page 506), as well as with acute articular rheumatism, but less frequently and with less intensity. Before giving full assent to the deductions of Dr. Charcot I should feel inclined to pause a little, as it is possible that the form of the disease in which acute cardiac inflammation has occurred may be rather that of true articular rheumatism of a very subacute character. Whenever rheumatic fever is found to have preceded any variety of rheumatoid arthritis, there is no difficulty in attributing the heart affection to it.

NATURE OR PATHOLOGY OF RHEUMATOID ARTHRITIS.

Our positive information as to the intimate nature of this form of arthritis is exceeding slight; as we have already shown, no proof has yet been afforded that there is a morbid principle present in the blood or that any alteration in its composition has ensued; the changes in the inflamed structures are completely different from those which occur either in gout or true rheumatism, for deposits of urate of soda are never seen in rheumatoid arthritis, but in lieu of this there is evidence of ulceration of the articular cartilages and alterations in the osseous tissues.

It may be that the peculiarities of this form of disease depend rather on an alteration in the tissues than on the presence of a morbid matter in the fluids; in other words it may be a form of ulceration and disintegration in these slightly vascular structures, arising from deficient nutrition.

Dr. Fuller, who appeared to have a strong objection to the use of the name Rheumatoid Arthritis, nevertheless held the same views as myself as to the nature of this affection, or rather as to what the disease is not: this will be seen from the following quotation from his work:—

"The disease should not be regarded as of a hybrid character, or, in other words, made up in part of rheumatism, in part of gout. It is my firm conviction that, just as true rheumatism and true gout do both manifest themselves at different periods of life in the same individual, so rheumatic gout may arise in a person who either has been, or may hereafter become, subject to true rheumatism or true gout, and that it has no connection with either of these diseases, beyond that which attaches to it in virtue of its being a constitutional disorder, producing local manifestations in the joint. Not only does analysis of the blood, and of the fluid effused into the joints in these cases when well marked and distinctive, prove the absence of lithic acid, the poison of gout, as a cause of the articular inflammation and enlargement, but the rare occurrence of any gouty deposit in the joints, in cases answering to my description of rheumatic gout, renders it manifest, even to a superficial observer, that the presence of true gouty symptoms is a mere coincidence, and by no means essential to the existence of the disease. On the other hand, analogy furnishes strong grounds for the belief that the articular mischief is not due to the presence of lactic acid, or whatever may be the materies morbi in true rheumatism, whilst the rapidity with which structural disorganization of the joints supervenes, even when the local action is apparently least acute, and when the general symptoms are certainly not indicative of febrile disturbance, is a further proof that it is essentially distinct from true rheumatism, as typified in rheumatic fever or in the ordinary chronic form of the disease. Indeed, the circumstances under which rheumatic gout occurs, the extraordinary obstinacy of its symptoms, the peculiar alteration in the structure of the joints, which forms its most characteristic feature, and the class of remedies by which it is most successfully combated, all seem to indicate a close connection with some peculiar constitutional taint."

It is a much easier task to prove what rheumatoid arthritis is not than to give the slightest clue to what it is; at present I do not wish to offer a strong opinion as to its nature. It appears to result from a peculiar form of mal-nutrition of the tissues of the joints, being an inflammation accompanied with defective powers; but there is no evidence, upon which any reliance can be placed, to show that it depends either upon the presence of any morbid principle, or upon a weakened condition of the vessels or structures of the affected parts. It is most desirable that the subject should be much farther investigated.

CHAPTER XVII.

RHEUMATIC GOUT CONTINUED:—TREATMENT OF RHEUMATOID ARTHRITIS—OF THE ACUTE FORM—OF THE CHRONIC VARIETIES—VALUE OF SPECIAL MEDICINES IN THIS DISEASE—VALUE OF MINERAL WATERS IN—TURKISH BATHS IN—LOCAL TREATMENT OF RHEUMATOID ARTHRITIS—DIET—REGIMEN—CASES ILLUSTRATING TREATMENT—DIAGNOSIS OF—TABLE GIVING THE DIFFERENTIAL DIAGNOSIS OF GOUT, RHEUMATISM, AND RHEUMATOID ARTHRITIS—ILLUSTRATIVE CASES OF RHEUMATOID ARTHRITIS—PROGNOSIS OF.

ALTHOUGH it must be confessed that there is still much scope for future development of the therapeutics of rheumatoid arthritis, yet, at the same time, the adoption of judicious means is often attended with satisfactory results in the treatment of this disease.

It is most important that we should not attempt to treat the disease in the same way as gout, for colchicum is for the most part injurious, and a spare diet far from beneficial. Nor must we deal with it as with simple rheumatism, for the alkaline treatment so serviceable in the latter is generally prejudicial in the former disease.

My own experience enables me confidently to state that much injury is frequently produced by injudicious treatment in rheumatoid arthritis, usually arising from a wrong view being taken of its nature, and especially from its being confounded either with gout or rheumatism.

I propose first to consider the treatment of rheumatoid arthritis when it assumes an acute form; then the general treatment of the more chronic forms; and afterwards to enter a little more into detail as to the value of special remedies and of baths and mineral waters in this disease.

Treatment of acute Rheumatoid Arthritis.—In this form of the disease, which is quite exceptional, the plan of treatment to be adopted is not unlike that which is employed in other inflammatory affections; taking care, however, not to lower the powers of the system, remembering that the disease itself is always of an asthenic character.

As the joints are more or less acutely inflamed, the patient should be kept perfectly at rest, so as not to disturb the parts; and often it is advisable to keep him in bed for a short time, a plan which is useful not only to secure more complete quiet for the joints, but also to keep up the action of the skin. When the temperature is at all high, salines are useful, and I have then usually had recourse to a mixture of citrate of potash and carbonate of ammonia, and after a very short time to one of citrate of potash and quinine rubbed up with a little compound powder of tragacanth. Sometimes, if the pain is increased by the warmth of the bed, a few grains of iodide of potassium may be added with advantage. The bowels should be kept fairly acted upon; the urine, if scanty and high coloured or thick, is usually brought to a healthy state by the use of the saline remedies above mentioned.

The local treatment should consist, as before said, in keeping the joints perfectly quiet, and wrapping them up, if the pain is severe, with cotton wool, covered with oil-silk or gutta-percha sheeting; at times, if the pain is excessive, the joints may be painted with belladonna and morphia, for which purpose the liniment of belladonna, having morphia dissolved in it, is most effectual. Now and then a blister may prove of service in subduing the acuteness of the inflammation and causing absorption of the effused fluid. Sometimes a spirit lotion gives relief applied on lint covered with oil silk, and whisky or eau de cologne are often thus employed.

The diet should be light, but at the same time nutritious, and gradually improved as the appetite returns. If necessary, a little brandy or whisky may be given freely diluted, or claret and water if preferred.

Under this treatment a patient usually loses in a week or two all the acute symptoms, and now and then even altogether recovers, but for the most part the disease assumes a more chronic form, which usually requires a considerable modification of the treatment.

Treatment of chronic Rheumatoid Arthritis.—In this form of the disease it is common to find a depressed state of the general system, not accompanied with febrile disturbance, but associated with much irregularity of the various functions, and especially those connected with the nutritive processes of the economy.

To combat this condition it is necessary to pay particular attention to the general health, and to effect this we must keep up the activity of all the functions of the body, at the same time that we are endeavouring to give tone to the system and to improve the condition of the blood.

In the first place, we must pay attention to the digestive organs, and if they are found to be weakened, endeavour to restore their tone by bitter stomachics, given alone or combined either with some mineral acid, as nitric, sulphuric or hydrochloric acid, or sometimes with carbonate of ammonia; if, on the other hand, there is evidence of irritation of the mucous membrane, we should try to soothe this by giving some alkali, as the solution of potash, hydrocyanic acid, or bismuth; occasionally the use of pepsine with the food is desirable.

The condition of the bowels should also be attended to, but it is important not to give any purgative which is likely to cause debility. I am constantly in the habit of ordering a powder, consisting of equal parts of powdered guaiacum, sulphur, and carbonate of magnesia in a little milk, and find it most effectual; at times, if there is much evidence of portal congestion, small quantities of the Friedrichshall, or some other similar water, diluted freely with twice its bulk of boiling water, or small doses of the natural Carlsbad salts in a tumbler full of hot water, may be taken in the early morning, when fasting, with great advantage.

The ordinary compound rhubarb or colocynth pill in many cases answers every indication.

The functions of the skin and kidneys should not be overlooked; sometimes there is special dryness of the skin with or without some eruption, and this may be often corrected by combining some neutral salt of ammonia with any other remedy which is required. The urine in the chronic form of rheumatoid arthritis is seldom much altered either in quantity or composition, unless the disease is accompanied either with albuminuria or lycosuria; if such be the case then special treatment directed to the amelioration of these conditions must be resorted to. If there is simply a deficient urinary secretion, the salts of potash, as the citrate, will generally be sufficient to correct this error.

If there be any great deficiency in the power of the circulation, and especially if anæmia be present, then the preparations of iron usually prove of considerable value in giving tone to the system and improving the quality of the blood; the choice of the preparation must be regulated by the peculiarities of the case; if the habit is relaxed, then the more astringent salts, as the sulphate or perchloride should be chosen; if simple anæmia is prominent, then the reduced iron, the ammonio-citrate of iron, or some similar compound may be selected. The perseverance for a long time in the use of ferruginous salts is most useful when the patient is subject to coldness of the extremities and other signs of a languid action of the heart.

Quinine and the various preparations of cinchona barks are of much service when there is any evidence of debility either of the nervous or vascular systems, but they possess no special powers in arresting the progress of this disease.

Cod liver oil in many cases is of striking value, especially in weakened and spare habits, and if there is any undue waste going on in the body; I frequently prescribe it at the same time with tonics, or alternate its use with them.

Our great object throughout the treatment should be, as before observed, to restore or maintain the strength of the system, and as want of tone may depend on various causes, so the kind of tonic must be adapted to the individual case.

There are certain special remedies which may often be beneficially given, more particularly with a view to correcting the morbid action of the joints, and of these we shall speak a little more at length.

Guaiacum is occasionally of great assistance when there is deficiency in the extreme circulation, for it appears to have some controlling power over morbid action in the less vascular tissues. It is best given in the form of the ammoniated tincture of the resin, and this preparation can generally be made to sit easily upon the stomach by being rubbed up with mucilage and combined with the compound tincture of cardamoms, or some other aromatic. Now and then it acts on the bowels, especially if scybalæ are present, and sometimes it appears to irritate the mucous membrane. The compound decoction of sarsaparilla is sometimes of service, a result partly due to the guaiacum, serpentary, and mezereon which it contains—drugs whose action is in many respects allied to that of guaiacum.

Iodine, either in the form of iodide of iron or iodide of potassium or free iodine, may frequently be prescribed with advantage, and I have had many patients under my care, suffering severely from rheumatoid arthritis in the joints both of the upper and lower extremities, who, by perseverance for a long time in the use of the syrup of iodide of iron, have become quite restored to health. In some of these cases the disease was so severe as to threaten complete crippling of the most important joints of the body.

With regard to iodide of potassium I may state that it is also a valuable remedy in this disease, but in most cases it requires to be combined with some tonic. If there is much increase of pain in the joints at night it usually relieves this symptom ; I constantly order it in conjunction with quinine.

I have not myself as yet had much experience of the action of iodine in a free state in rheumatoid arthritis, but Dr. Trousseau speaks most highly of its value and quotes the opinion of Dr. Lesègue, who states that a man in the Hôtel-Dieu had all the joints of the feet and hands deformed, the wrists, elbows, and shoulders slightly affected, the knees swollen and painful, and the cervical portion of the vertebral column not free from the disease. The patient was forced to remain in bed, and was treated by the administration of the tincture of iodine. After some weeks the affection was arrested in its progress; at the end of a month some of the joints had regained their mobility, and after four months' treatment with the iodine he was sufficiently well to perform the laborious duty of sick attendant in the hospital. Trousseau ordered the iodine tincture in ten drop doses in sherry wine or sugared water to be taken twice a day, at the morning and evening meal; the quantity was afterwards gradually increased to 30, 60, and even 90 drops without causing any inconvenience to the stomach, but on the contrary with apparent augmentation of the digestive powers. Trousseau states that he does not consider that the iodine has any specific action on this form of rheumatism, as it does not produce equally beneficial effects in all cases; he is inclined to think its action is complex, that it acts upon the general nutrition by assisting digestion, and in this way exerts an indirect action, in some patients, upon the articular disease.

Arsenical preparations sometimes appear to be of signal service, and for twenty years I have been in the habit of prescribing them in rheumatoid arthritis. Arsenic has undoubtedly a marked action upon the skin, a fact to which every practitioner who has employed it in chronic cutaneous affections can bear witness; it would appear also that it exerts an influence over the fibrous and other tissues of low vitality, and acts upon them as an alterative. In some cases of rheumatoid arthritis I have seen marked benefit arise from its use, but in others arsenic has failed to alleviate, though pushed to its full dose and persevered with for a long time. More commonly I have prescribed the drug in the form of the arsenical solution of the pharmacopœia, sometimes as arseniate of soda, which, from some carefully noted observations, I find to be less irritating to the mucous membrane than the arsenite of potash, when the amount of the metal administered is the same. In giving the preparations of arsenic it is advisable to pay attention to the state of the stomach in reference to food, and to administer them soon after a meal, as they are usually found to cause less irritation to the mucous membrane under such circumstances. In some cases of rheumatoid arthritis I have had reason to think that the arsenic has had the effect of causing great congestion, or even an inflammatory condition of the liver; in these instances, however, the coincidence between the hepatic affection and the administration of the arsenic might possibly have been accidental.

Arsenic has been used for many years in the treatment of this disease, in 1807 by Dr. Jenkinson, and afterwards by Drs. Kellie, Begbie, and Fuller, and externally in the form of the bath by Dr. Noël Gueneau de Mussy. Dr. Charcot, in his notes to the French edition of this work, says that he has used arsenic largely at the Hospital of the Salpêtrière, sometimes with considerable success, at other times with complete failure. Dr. Charcot thinks that arsenic is useless and even hurtful in any inveterate cases, and in subjects far advanced in age; also that it frequently increases the pains of the joints, and even for a time causes redness and swelling in parts previously free, so as to necessitate the suspension of this treatment; but that in general the tolerance for the medicine is established in a few days, and the dose can then be slowly increased.

Nux vomica and its alkaloid *strychnia* are also occasionally of value, not from their exerting any specific action upon the disease itself, but rather from their influence upon the muscles, which often become much

Local treatment of chronic Rheumatoid Arthritis.—The first question that arises is, as to the amount of movement of the affected joints which is allowable with safety. In the acute stage perfect rest should be enjoined, to aid the subsidence of the inflammation ; but as the disease becomes less acute in character, then a moderate amount of movement is not only not injurious but even beneficial, as it tends to prevent a rigid state of the articulations. The amount of such movement must in all cases be regulated by the effects produced by it ; it should always be short of causing any pain or tenderness which may last beyond a few hours. The movements should also be very limited in extent, and a plaster or some mechanical support is frequently desirable to effect this.

Various local remedies have been proposed in rheumatoid arthritis.

The local vapour-bath often gives relief to joints that are affected, especially if there is much tenderness, and it may be frequently applied without fear of injury. Trousseau was in favour of the use of the *hot sand bath* or douche. The affected joints are either to be plunged into hot sand, or the sand, as hot as it can be borne, should be poured upon them. This bath or douche should be continued for some hour or so, and repeated two or three times a day. The sand should be kept at the same temperature during the time, which can be easily managed, as sand cools slowly and can be easily replaced when it begins to cool. Trousseau states that when this treatment is properly employed, the patient soon experiences decided relief and a rapid diminution of the articular enlargements ensues.

When pain is a very prominent symptom, relief is often given by the application of a belladonna paint, or by

In many cases Wildbad has proved valuable, as likewise Teplitz, Gastein, and Buxton.

It is important that patients suffering from this disease should, after treatment by the above waters, be toned up, and a subsequent course at Schwalbach, Spa, or St. Moritz is often beneficial; at the last-mentioned place the bracing character of the air not unfrequently proves of signal service. At Buxton, also, the influence of the bracing air adds greatly in many cases to the value of the treatment.

The *Turkish Bath* is frequently recommended in this disease, not only by the physician, but also by the friends of the patients, and is often looked upon as having an undoubted curative power.

My experience of its use may be thus summed up:

1. During the time the patient is taking the bath and for a short time afterwards, a feeling of relief from pain is experienced, and the injured joints become much more moveable.

2. It is very seldom that permanent benefit is obtained from its use in rheumatoid arthritis.

3. It very often does much mischief from inducing debility.

Although I have on several occasions cautioned patients not to use the Turkish bath, that advice has not unfrequently been disregarded, and I have seen the same patients at a later period suffering more severely from the disease, owing to the treatment they had undergone.

4. I have also seen the excessive use of the Turkish bath distinctly cause rheumatoid arthritis to appear in the extreme joints of all the fingers, and this in a person who had previously enjoyed entire immunity from the disease.

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Sometimes a moderate amount of counter-irritation is useful, and this is often advantageously produced by the use of an iodine paint. Iodine must not be looked upon simply as a counter-irritant, for it possesses besides this an alterative local action, the result of its being partly absorbed.

Some patients derive much ease from the application of a spirit lotion, the joints being at the same time covered with oil silk to prevent evaporation.

Friction, either with some simple emollient, or with iodine or mercurial ointment, or with one containing either the red or green iodide of mercury, is also useful; in applying these we must remember that as absorption takes place freely, the alterative powers of the drugs become manifest. The use of these means must be persevered in for a long time in order that they may prove effectual. I am constantly in the habit of having the joints, when in a condition to bear friction, first smeared and rubbed for a few minutes with some of the above ointments, and then continuously rubbed for ten or fifteen minutes with some bland greasy substance, as goose grease, and I feel assured that the mere introduction of such bland oleaginous matters is of much service, as I cannot help thinking that the nutrition of the joint is influenced thereby.

When the disease in any joint has become very chronic, I am constantly in the habit of ordering a plaster to be applied; in the first place, it gives a certain amount of support to the injured joint, and secondly, it may prove valuable by keeping up a slight counter-irritation, and by causing an alterative action from the absorption of the active principle of the plaster. The plasters I most commonly make use of are those of iodine, mercury, galbanum, ammoniacum, opium and belladonna, but when the skin is very irritable the soap or lead plaster may be employed, these latter of course only acting as mechanical supports.

Diet and Regimen.—In chronic rheumatoid arthritis we must not only aim at restoring the digestive and assimilating functions, if deranged, to a healthy state, but we must likewise take care to supply the system with appropriate nourishment. I consider it of the utmost importance throughout the whole course of the disease to support the system, and to allow the patient as nourishing a diet as he is capable of properly digesting. If the appetite is not very good, then food should be given in small quantities and more frequently. Meat should form a considerable portion of the diet, and when it cannot be taken as ordinarily cooked, it is of advantage to have it in the form of potted meat or panada, taking care that the whole of the juice of the meat be introduced. Any kind of animal food which is found to be easily assimilated may be administered.

I often find that patients suffering from this disease are prohibited from taking malt liquors, but I have every reason to know that when the affection is one of true and uncomplicated rheumatoid arthritis, it is not aggravated by them; in fact, when they agree with the stomach, they often enable the patient to take more solid food, and at the same time cause its more easy assimilation. I have seen many patients suffering from this disease derive marked benefit by being allowed a little good stout or pale ale with their food. The same remarks apply to the use of sound wines, as claret, burgundy, and good old port or sherry. My rule is to give sufficient of these alcoholic beverages to support the tone of the whole system, but not enough to excite the circulation and thereby produce any subsequent reaction.

It is of the utmost importance that the subjects of rheumatoid arthritis should have as much fresh air as possible, and a change of residence from time to time is often desirable; if the state of the limbs be such as to prevent walking or horse exercise, carriage airings should be resorted to. The proper ventilation and regulation of temperature of the sitting and sleeping apartments should not be neglected.

Lastly, the clothing should be warm, but not sufficient to overheat the patient, or cause too much perspiration; as a rule, flannel should be worn next the skin, the thickness depending on the climate and season.

In concluding this part of our subject, I will append a few cases illustrating the value of the proper treatment of rheumatoid arthritis, and showing that the course of the disease may be effectually arrested and the patient often restored to health.

CASE:—Slight rheumatoid arthritis in a young lady, quickly relieved and cured by a tonic restorative treatment.

A young lady about seventeen years of age, subject to cold extremities and other signs of a languid circulation, some year or so since experienced pain, tenderness, and swelling of the ankles. At first these were the only joints affected, but after some months the fingers and wrists became implicated, and were so on her first visit; the phalangeal joints were tender and also a little enlarged, some of the toes were likewise painful, especially the great toes. The tongue was red and somewhat glazed, but there was no thirst; the bowels were regular; the skin acted freely. Pulse small, 96 (probably excited). The mucous membranes were distinctly pale, and a loud venous murmur could be heard in the neck; the catamenia were regular; she had become thinner of late. Weather appeared to have some influence upon the disease, and she stated that she felt worse when it was cold. Under a treatment directed to fortify the system, consisting of a combination of sulphate of iron and quinine, and the application of a moderately strong tincture of iodine to the joints, this patient rapidly improved, and soon became quite well.

Case:—Rheumatoid arthritis coming on at the time of the cessation of the catamenia, and much improved by treatment.

The patient was a lady, fifty-two years of age, having no hereditary predisposition to any joint affection; she was married, and had three children. The catamenia, which were always very scanty indeed and occurred at prolonged intervals, had ceased about eleven years. The joint affection seems to have been noticed about the time of this cessation, and appeared to be excited by exposure to cold and damp, coming on first in the shoulders, then in the wrists and hands, and afterwards in the knees and ankles. During the last five years she had become much worse, and especially within a few months of her consulting me; all the joints which had been implicated from the first attack, had remained so in a greater or less degree.

This patient was stout, but the complexion and mucous membranes were pale, and the muscles flabby; she was subject to cold extremities; the pulse was weak and quick; at times she felt faint, and she suffered from atonic dyspepsia and constipation. The knees were greatly swollen, grating much on movement, the wrists very stiff, almost anchylosed, and many of the other joints were more or less affected. By treatment directed to the improvement of the general health a marked alteration ensued in the state of this patient; her colour improved, the joints became smaller and more flexible, more especially the wrists, which were at first much stiffened, and she was enabled to walk some little distance with comparative ease. The treatment consisted in the use of iron and quinine, with the occasional administration of the arsenical solution, and, locally, in the application to the joints either of the ammoniacum and mercurial plaster, or of the strong tincture of iodine, but not so as to produce any injury to the skin.

Case:—Rheumatoid arthritis coming on at the cessation of the catamenia, much improved by treatment.

This lady was fifty-three years of age, and her history and symptoms were as follows. No hereditary predisposition to gout or rheumatism could be traced from her parents, but one aunt had suffered from some low form of joint disease, and another from an affection of the eye, termed rheumatic. Her general health had been moderately good; the catamenia had ceased about four years before, when the joint affection came on. At first the joints of the hands became swollen, the knees were afterwards implicated, then the ankles, elbows, and so on. At the time of her first visit the knees were much swollen, mis-shaped, and very stiff; on attempting to move the joints, a loud crackling or grating was heard; the same condition was found in the ankles and elbows, and the wrists and hands were stiff and altered in shape. There was also some stiffness about the neck, and inability to open the mouth wide from the articulations of the lower jaw being implicated. The extremities were very liable to be cold, the pulse was weak and quick, the mucous membranes were pale and anæmiated.

By the aid of fer réduit, continued for a long time, together with the use, at different times, of other tonics, as bark, cod-liver oil, and small doses of arsenic, and the occasional application of strong tincture of iodine in streaks upon the joints, this patient, from being completely crippled, was able to move about, and was still gaining power when last seen in consultation.

Case:—Rheumatoid arthritis, apparently induced by severe mental depression, much improved by treatment.

A lady, thirty years of age, consulted me with the following symptoms. Her health had been good, but about ten years since she had had a severe illness, followed by swelling of the body, legs, and face, which lasted about two months, and passed for dropsy. About three years ago, having previously suffered from very severe mental depression, the articular affection appeared, first in the phalangeal joints of the fingers and thumbs, then in the elbows and shoulders, and afterwards in the knees and feet. The right elbow has been especially injured and is now partially anchylosed, the movements of flexion and extension being very limited. Her general health is now far from good, and there is marked anæmia; the catamenia too frequent, the pulse small, and the appetite bad; she has also become much thinner of late.

Under a tonic treatment, consisting of iron, quinine, and cod-liver oil, this patient improved much in general health, but the elbows remained very stiff. The progress of the articular affection, however, has been arrested.

Case:—Rheumatoid arthritis, arising without any apparent cause, but preceded by marked derangement of the general health; much improved by treatment.

A lady, thirty-five years of age, came under my care, suffering from the following symptoms:—

No hereditary tendency to any joint affection could be discovered, her health had usually been tolerably good, but for some little time before the commencement of the joint affection she had been getting decidedly weaker.

About two months before she consulted me she had noticed pain in the right ankle, attended with some swelling; the knees soon became stiff and then the left ankle; soon after this the smaller joints of the hands and the elbows were implicated. From the first appearance of the disease the joint affection had never left her, although for a time there was a slight improvement; in fact, the course of the disease has been uniformly progressive, attacking joint after joint, and always leaving them more or less damaged.

When first seen this patient was thin, felt very weak, and was easily fatigued; pulse small and quick; extremities cold; complexion pale, tongue clean, but a little glazed, and appetite bad; catamenia regular. Many of the joints of the fingers were enlarged, tender, and stiff, as likewise the wrists and elbows; the neck was also somewhat rigid. The joints were always very stiff in the morning.

This patient improved much under the use of cod-liver oil, cinchona bark, and small doses of the arsenical solution, together with the application of a strong tincture of iodine to the joints, which relieved the local symptoms.

Case:—Rheumatoid arthritis threatening rapid crippling, greatly relieved in a few months by treatment.

In the autumn of 1875, I saw a young lady who had suffered for nearly a year from rheumatoid arthritis. Her elbows were almost anchylosed, the wrists and many of the smaller joints of the hands, as also the knees and ankles, were swollen and painful. She was also suffering from stiffness of the neck, and some rigidity of both temporo-maxillary articulations. The general health was bad, with much anæmia and defective nutrition. I gave her syrup of the iodide of iron in doses of from thirty to sixty minims twice a day, and from two to four teaspoonfuls of cod-liver oil daily, and iodide of cadmium ointment locally. This treatment greatly relieved all the joints except the elbows, which would seem to be irremediably injured and anchylosed.

Case:—Severe rheumatoid arthritis, threatening to cause crippling, cured by treatment.

A gentleman, aged 56, who had usually enjoyed fair health, came under my care in July, 1873. During the previous October he had noticed that his finger-joints were painful, then other joints became implicated, and the disease continued to advance until I saw him, when his condition was as follows. Countenance pallid, and lips, gums, and tongue somewhat anæmiated, appetite fair, bowels a little constipated, and urine clear. The hands were generally swollen, and nearly all the joints of the fingers much enlarged, the wrists and shoulders tender, the neck rather stiff, as also the temporo-maxillary joints, so that pain was caused by mastication. The feet were tender, also the knees, and there was some considerable irritation of the eyes from a low form of conjunctivitis and sclerotitis, evidently of the same character as the joint affection.

From July, 1873, till May, 1875, this patient was under treatment, which consisted in the administration of cod-liver oil from time to time, also of the syrup of the iodide of iron, and occasionally of the arseniate of iron, and of quinine and nux vomica; these various remedies were given alternately, and the bowels were regulated with sulphur and guaiacum. Locally the joints were treated sometimes by an ointment of iodide of cadmium, sometimes by the red or green iodide of mercury, and sometimes by the use of very hot water followed by cold salt sponging. Under this medicinal treatment, aided at times by change of air, an improvement gradually took place, and at the last visit the following note was taken. "Has continued the oil and medicine; has increased in weight nearly three stone since he first came under treatment; eyes all but well; can walk well, and there are no joints which give him any trouble. The anæmic state has disappeared, and altogether he is looking completely altered, having, in fact, the aspect of health."

Case:—Severe rheumatoid arthritis cured by appropriate treatment.

A Scotch gentleman, aged 49, having no very marked hereditary predisposition to any joint affection, came under my care in July, 1869. In the previous October he had noticed pain and tenderness of the left shoulder, which soon became better under treatment, but which recurred in a few weeks; then the right shoulder was affected, and soon afterwards other joints, the disease gradually progressing up to the time he was seen; he had, it appears, been in good health up to October. My first note is as follows:—"Elbows somewhat flexed, cannot be quite straightened, nor can the forearm be fully rotated; the finger joints of the hands and the wrists are more or less swollen and the ankles and knees are also affected, being somewhat enlarged and tender; the jaws (temporo-maxillary joints) rather stiff and painful, also the neck; the patient has become thinner of late and is looking pale, but the appetite and digestive organs are in fair order. The pulse is rather small, its rate 84 per minute." I sent him to Aix-la-Chapelle and afterwards to Schwalbach; at the former place he took the baths and drank the waters, and was shampooed, at the latter he also took the baths and drank the ferruginous waters.

for during the remainder of the patient's life the nodes gradually enlarge, impeding more and more the motion of the limb; the malady spreads to other joints, without leaving or producing any alleviation in those which had been previously attacked."

To this diagnosis of Haygarth, which is for the most part correct, many additional points of difference might be added. These we will arrange under separate heads.

1. It is doubtful whether rheumatoid arthritis is capable of being inherited in any marked degree. It has already been stated that Dr. Charcot found hereditary liability in only one-sixth of his cases. Gout is distinctly an hereditary disease, but rheumatism much less so.

2. The sex of the patient is not of much value as both sexes are liable to the disease, though women appear to be more so than men; the reverse holds good in gout.

3. Neither does the age of the patient aid us much, as we have shown that it occurs in children of 3 years of age, also in old people when over 70; still it is much more frequent before than after 40, as also is true rheumatism, whereas the opposite holds good in regard to gout.

4. Rheumatoid arthritis usually begins as a subacute disease, and the joint affection gradually increases; but now and then it commences in an acute form; the latter class of cases may be mistaken either for acute gout or rheumatism. It, however, exhibits peculiarities in its course by which it may be usually distinguished, one of the most marked being its *progressive* character.

(*a*). From acute gout it may be distinguished by the length of paroxysm and the absence of periodicity, by the large and small joints being often equally attacked in its outset, and by the great toes not being specially implicated, as they are in gout.

Under a treatment consisting chiefly of the administration of iodide of iron, arseniate of iron, and cod-liver oil, varied from time to time with other tonics, he improved considerably, but did not become well, so at the end of August I sent him to Aix-les-Bains; there he underwent the ordinary course pursued at the place, and became well as to the skin, and much better as to the joints, which continued to improve after he left. During the next ten months he remained so well that I did not see him, but after that a few spots of psoriasis reappeared, and he again went to Aix, but without benefit, in fact the skin affection increased; he was again put under medicinal treatment, and of late has become almost well, better than he has been for many years.

DIAGNOSIS OF RHEUMATOID ARTHRITIS.

It is a matter of great importance to make out clearly the diagnosis of cases of rheumatoid arthritis, as the nature of the treatment to be adopted so much depends on the results we arrive at. Haygarth, who, as before stated, terms the disease nodosity of the joints, says: "The nodes appear most nearly to resemble gout; both of them are attended with pain and swelling of the joints, but they differ essentially in many distinguishable circumstances. In gout, the skin and other integuments are generally inflamed, with pain, which is very acute, soreness to the touch, redness and swelling of the soft parts, but in no respects like the hardness of bone. The gout attacks the patient in paroxysms of a few days, weeks, or months, and has complete intermissions, at first for years, but afterwards for shorter periods. The gout attacks men much more frequently than women. There is one distressful circumstance which distinguishes this disorder; it has no intermission, and but slight remissions, for during the remainder of the patient's life the nodes gradually enlarge, impeding more and more the motion of the limb; the malady spreads to other joints, without leaving or producing any alleviation in those which had been previously attacked."

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(*b*). From acute rheumatism it is separated by the comparative freedom from constitutional disturbance, the longer duration of the paroxysm, and the absence of acute cardiac complication.

5. Chronic rheumatoid arthritis can be distinguished from chronic gout by the absence of all evidence of urate deposits in the ears or in the bursæ of the elbows or other parts in the former disease, and their frequent presence in the latter; the distortion of the joints may, however, be very similar, as has been clearly shown when treating of chronic gout.

Chronic rheumatoid arthritis is more easily diagnosed from sub-acute rheumatism, as the latter disease produces no amount of alteration in the shape of the joints.

6. The absence of uric acid in the blood or blister serum in rheumatoid arthritis distinguishes it from gout, but not from rheumatism.

7. It is usual to find that the development of rheumatoid arthritis is preceded by a condition of depressed health, consisting in defective assimilation and a depressed state of the nervous system, caused usually by known predisposing causes.

8. There is one disease which is very difficult to separate from rheumatoid arthritis, namely, the rheumatism which frequently follows urethral affection; this latter affection often gives rise to the formation of pus, and the history of the case will enable us to arrive at a correct diagnosis.

Between rheumatism and this form of arthritis there is generally a great resemblance, but still many diagnostic phenomena can be detected, as will be observed from the appended tabular arrangement, which I have drawn up in order to show at a glance the characteristic differences of gout, rheumatism, and rheumatoid arthritis.

Table exhibiting the Differential Diagnosis of Gout, Rheumatism, and Rheumatoid Arthritis.

Gout.	Rheumatism.	Rheumatoid Arthritis or Rheumatic Gout.
Strongly hereditary.	Less so than gout.	Much less so than gout.
Much more frequent in males.	More frequent in females.	More frequent in females.
Seldom occurs before puberty, and generally much later.	More frequent in the young, and before middle age.	Occurs both in young and old.
Induced by high living, wine, and malt liquors.	Occurs in the weak, and not caused by wine, &c.; excited by cold and damp.	Often induced by depressing causes, and sometimes excited by cold: not induced by wine, &c.
One or more of the smaller joints particularly affected in early attacks, and especially great toe.	Large joints more affected than small, usually several in number.	Large and small joints about equally affected.
Great pain, œdema, and desquamation of cuticle.	Pain less intense; seldom œdema.	Less pain; much swelling, and often some œdema.
Does not induce acute inflammation of the structures of the heart.	Often causes acute pericarditis and endocarditis.	No tendency to cause inflammation of the heart.
Febrile disturbance moderate.	Febrile disturbance great; more than can be accounted for by the local inflammation.	Generally but little febrile disturbance.
Paroxysms periodic in early attacks.	Attacks not periodic.	No periodicity. The disease progressive.
Early attack lasting but a week or ten days.	Attacks generally longer in duration than in gout.	Duration of attacks indefinite.
Blood rich in uric acid.	No uric acid in blood.	No uric acid in blood.
Constant deposit of urate of soda in inflamed cartilages and ligaments.	No deposit of urate of soda; no ulceration of cartilages.	No deposit of urate of soda; ulceration of cartilages.
Often leads to kidney disease.	No tendency to cause kidney disease.	No tendency to induce kidney disease.
Often produces chalk-stones externally.	Never causes chalk-stones.	No chalk-stones produced, but often much swelling of joints.

CASES OF RHEUMATOID ARTHRITIS, ILLUSTRATING CERTAIN PECULIARITIES IN THE DISEASE.

CASE:—Rheumatoid arthritis occurring in an old gentleman in his seventy-ninth year.

A gentleman, seventy-nine years of age, previously enjoying good health, had, for about six months before coming under my care, felt pains in the joints of the upper extremities; the shoulders and elbows were first affected, afterwards the wrists and hands; when I first saw him the hands were painful, the wrists stiffened, the fingers swollen; the first row of phalangeal joints much more affected than the rest; the legs and feet were scarcely implicated. The pain appeared to be very severe, and increased at night so as to prevent sleep; the tongue was somewhat furred, the heart's action weak and intermittent, and there was much irritability of the bladder from prostatic disease. Under the influence of a tonic plan of treatment, consisting at first of bark and ammonia, and afterwards of small doses of reduced iron, the joints became much less swollen and stiff, the pain greatly diminished, and the sleep improved, in fact, the progress of the joint affection appeared to be stopped, and the alterations already induced in the articular structures considerably ameliorated.

I have seen several other patients suffering from rheumatoid arthritis, in whom the disease first appeared when they were considerably advanced in life, that is, from sixty years of age and upwards; in such cases it seldom evinces so great a tendency to run a rapid course as in younger subjects, but still it may be acute in its character.

CASE:—Rheumatoid arthritis, probably arising from prolonged fatigue and great mental anxiety.

A lady, fifty years of age, came under my care with the following symptoms. Her general health was formerly pretty good, but she had never been strong. The disease under which she was suffering had commenced rather more than four years ago, at first in the hands and feet. It appeared from her history that she had shortly before this undergone much fatigue, and great and prolonged mental anxiety. From her own account she had been treated by powerfully depressing agents, among which were colchicum and the iodides, also by frequent baths, which, she asserts, made her much worse. At present she experiences pain in almost every part of the body, which is increased when in bed. The knees and ankles are much swollen and stiff, and the shoulders are implicated; many of the fingers are contracted and bent, the thumb joints are tender, and there is much grating both felt and heard when they are moved; the wrists are also swollen and painful, and scarcely allow of any motion. Added to all these discomforts, the patient is unable to move her neck with anything like freedom.

The catamenia ceased about seven years ago.

CASE :—Rheumatoid arthritis, illustrating the influence of frequent childbirth and hemorrhage upon its development.

A lady, aged forty-seven, consulted me, suffering from rheumatoid arthritis, and gave the following account of her case.

Her father and mother had both suffered from joint disease. She herself had had sixteen children, including several miscarriages. The eldest was twenty-seven, and the youngest three years of age. During the last twenty years she had been very weakly, from the frequent labours and attendant hemorrhage.

About a year ago she had first noticed pain and swelling of the hands and wrists, and to some extent of the elbows, since which time many of the joints, both of the upper and lower extremities, have been attacked, and after an articulation has once been affected it has always remained in an injured condition.

At the time of her first visit the shoulders, wrists, hands, knees, and ankles were swollen and painful; the neck was likewise much stiffened from the upper cervical vertebræ being implicated. The pain was considerably increased after the patient had been in bed for an hour or so, and upon waking she was so stiff as to be unable to move. Her general health was not good; the pulse was weak, 72; the complexion pale and sallow; the skin rather dry; the tongue furred, and the appetite bad. She had also of late lost much flesh. The catamenia had been absent for about eight months, and irregular and scanty for three years.

I have had several other cases under my care, in which rheumatoid arthritis has been rapidly developed after considerable loss of blood from frequent miscarriages or from numerous labours occurring within a short period.

CASE:—Rheumatoid arthritis, probably affecting the laryngeal structures, as well as the joints.

A lady, about fifty-eight years of age when she first consulted me, had suffered from pain in her limbs for twelve or fourteen years, in fact soon after her last confinement; several of the small joints of the hands were stiffened, some a little swollen; the last phalangeal joints of many of her fingers were enlarged, so as to give the peculiar nodose appearance; the hips were distinctly affected and stiffened. Besides these symptoms, this lady suffered from her neck, which had been gradually getting stiff for about four years, but only very inconveniently so for the last eight or nine months; for some time there had been an uncomfortable state of the throat, causing a little hoarseness, and some dry cough with a pricking sensation, but there was no tenderness of the trachea or larynx and no pulmonary affection could be detected either by percussion or auscultation.

I have seen other cases of laryngeal disease in subjects of rheumatoid arthritis, and am inclined to think that the structures of the larynx are liable to be affected in the same manner as those of the joints; in other words, that the larynx may itself suffer from rheumatoid arthritis.

CASE:—Very severe rheumatoid arthritis, apparently caused by severe cold and damp.

A gentleman, thirty-seven years of age, having no hereditary predisposition to gout or rheumatism, gave the following account of his case. About eleven years since, after a wet journey, he slept in a damp bed and on the following morning complained of pain and tenderness in different parts of the body. In about a fortnight or three weeks the symptoms subsided and he was able to return home. Previous to the journey his health had been pretty good. Shortly after his return the articular affection came on, joint after joint becoming painful and tender, without any considerable swelling, though in all of them an almost anchylosed condition was produced. When this patient consulted me his general health was good but the state of the joints terrible. Most of the fingers were completely stiffened and distorted, as likewise the wrists; the left knee was semi-flexed, incapable of being extended, and only capable of being bent a few degrees; the right hip joint and left elbow were quite stiff; the neck, also, was scarcely movable, and many of the other joints were more or less affected. He appeared to have been treated at first with colchicum, iodide of potassium, and other remedies, but without any improvement. As the general health was good at the time of his consulting me, and as the progressive tendency of the joint affection appeared to have stopped, and the articulations which had been attacked were irreparably injured, of course little or nothing remained to be done by medicinal treatment.

PROGNOSIS OF RHEUMATOID ARTHRITIS.

Rheumatoid Arthritis is unquestionably a very untractable disease, which is not matter for surprise when we consider its ordinary antecedents. Its most common predisposing cause being a thoroughly impaired condition of the system, which in many instances has arisen from influences which have been in operation for years, it cannot reasonably be hoped that it is capable of a rapid cure; it is often a great achievement to arrest its further progress. In the early stages, if proper treatment be adopted, so as to meet the peculiarities of the individual case, and the structures of the joints are not as yet seriously injured, the prognosis is favourable although the recovery may be slow, a fact which is well illustrated in some of the cases above detailed. If, on the other hand, the patient is in any way weakened by a lowering treatment, then the probability of the disease becoming deeply engrafted into the system and causing irreparable mischief is very great.

When the disease is more advanced but the affected joints are few in number, and their mobility only partially interfered with, when, at the same time, there is freedom from any disease which must of necessity keep up the impaired state of health, then a moderately favourable view may be taken of the case, and recovery more or less complete may be hoped for. In cases of deep-seated articular mischief, where the joints have been completely denuded of their cartilages, and osteolites have been produced, with complete anchylosis, restoration of the impaired structures is, of course, impossible, although the general health of the patient in other respects is capable of great amelioration under judicious treatment. Strange to say, however, it sometimes does happen that even in the most hopeless cases, where there has been a crippled condition extending over several years, partial mobility of the impaired articulations is regained, and the locomotive power is, to a fair extent, re-established, a result which is due to the formation of false joints, so to speak, by a process of eburnation of the ends of the bones in some of the more important articulations. Nevertheless, it must be borne in mind that in all cases of this disease there is a great tendency to recurrence of the morbid symptoms, and, in looking over the history of very many of my recorded cases, I find that a patient not uncommonly has had threatenings of the disease a year or two previously, which passed off in a month or two, that a second premonitory attack of a severer character may have succeeded the first, and in its turn, owing to the patient being placed under favourable conditions, may have again passed off, that a few months more bring on a third attack, which assumes a character of greater permanency, progressing insiduously onwards from joint to joint, seizing on fresh articulations without releasing those first attacked, until ultimately the whole body becomes the victim of its inroads. Some time ago I was inclined to take a very desponding view of the amenability of this disease to treatment, but, year by year, I have become more hopeful, and I have frequently seen patients who, I feel sure, if they had submitted themselves perseveringly to a rational course of steady restorative treatment instead of being led by the solicitations of injudicious friends and empiricising advisers to give themselves up to every form of quackery, would have been restored to health instead of becoming, as many of them unfortunately do, miserable and incurable cripples.

APPENDIX.

ANALYSES OF MINERAL WATERS.

TABLE OF ANALYSES OF THE DIFFERENT SPRINGS AT VICHY AND THE NEIGHBOURHOOD.

Contents of a litre of water from each source, the weights expressed in grammes. (Referred to in Chapter XIII.)

	VICHY.								HAUTE-RIVE.	ROUTE DE CUSSET.
	Grande Grille.	Puits Chomel.	Puits Carré.	Lucas.	Hôpital.	Celestins.	Puits de l'enclos des Celestins. Puits Lardy.	Puits Brosson du Parc.	Puits d'Hauterive.	Puits des Dames.
Free carbonic acid . . .	0·908	0·768	0·876	1·751	1·067	1·049	1·750	1·555	2·183	1·908
Bicarbonate of soda . . .	4·883	5·091	4·893	5·004	5·029	5·103	4·910	4·857	4·687	4·016
„ of potassa . . .	0·352	0·371	0·378	0·282	0·440	0·315	0·527	0·292	0·189	0·189
„ of magnesia . . .	0·303	0·338	0·335	0·275	0·200	0·328	0·238	0·213	0·501	0·425
„ of strontia . . .	0·303	0·003	0·003	0·005	0·005	0·005	0·005	0·005	0·003	0·003
„ of lime	0·434	0·427	0·421	0·545	0·570	0·462	0·710	0·614	0·432	0·604
„ of protoxide of iron .	0·004	0·004	0·004	0·004	0·004	0·004	0·028	0·004	0·017	0·026
„ of protoxide of manganese	traces	traces	traces	traces	traces	traces	traces	traces	traces	traces
Sulphate of soda	0·291	0·291	0·291	0·291	0·291	0·291	0·314	0·314	0·291	0·250
Phosphate of soda . . .	0·130	0·070	0·028	0·070	0·046	0·091	0·081	0·140	0·046	traces
Arseniate of soda . . .	0·002	0·002	0·002	0·002	0·002	0·002	0·003	0·002	0·002	0·003
Borate of soda	traces	traces	traces	traces	traces	traces	traces	traces	traces	traces
Chloride of sodium . . .	0·534	0·534	0·534	0·518	0·518	0·534	0·534	0·550	0·534	0·355
Silica	0·070	0·070	0·068	0·050	0·050	0·060	0·065	0·055	0·071	0·032
Bituminous matter . . .	traces	traces	traces	traces	traces	traces	traces	traces	traces	traces
Total	7·914	7·959	7·833	8·797	8·222	8·244	9·165	8·601	8·956	7·811
Temperature	105° Fah.	111° Fah.	111° Fah.	85° Fah.	87° Fah.	55° Fah.	74° Fah.	72° Fah.	58° to 61° Fah.	Cold.

Analysis of the Kochbrunnen Spring, Wiesbaden (Freseni

TEMPERATURE, 156° FAH.

	In 1000 parts.	In the pint (7680 g
Chloride of sodium	6·83565	52·49779 grs.
„ of potassium	0·14580	1·11974 „
„ of lithium	0·00018	0·00138 „
„ of ammonium	0·01672	0·12841 „
„ of calcium	0·47099	3·61720 „
„ of magnesium	0·20391	1·56603 „
Iodide of magnesium	traces	traces „
Bromide of magnesium	0·00355	0·02726 „
Sulphate of lime	0·09022	0·69289 „
Silica	0·05992	0·46018 „
Carbonate of lime	0·41804	3·21055 „
„ of magnesia	0·01039	0·07979 „
„ of baryta	traces	traces
„ of strontia		
„ of protoxide of iron	0·00565	0·04339 „
„ of manganese	0·00059	0·00453 „
„ of copper	traces	traces
Phosphate of lime	0·00039	0·00299 „
Arseniate of lime	0·00015	0·00115 „
Silicate of alumina	0·00051	0·00392 „
Organic matter	traces	traces
Total solids	8·26266	63·45720 grs.
Carbonic acid, free and combined with carbonate	0·50822	3·90313 „
Nitrogen	0·00200	0·01540 „

Analysis of the Ursprung, Baden-Baden.

TEMPERATURE, 161° FAH.

In 16 fluid ounces there are contained:—

Chloride of sodium	17·50 grs.
„ of potassium	1·50 „
„ of magnesium	·50 „
Sulphate of lime	2·50 „
Carbonate of iron	·10 „

and less than half a cubic inch of carbonic acid.

Analysis of the Sprudel Spring at Carlsbad.

TEMPERATURE, 167° FAH.

In each 16 fluid ounces there are contained, besides a little dissolved carbonic acid :

Sulphate of soda	19·860 grs.
Carbonate of soda	9·690 „
Chloride of sodium	7·970 „
Carbonate of lime	2·370 „
„ of magnesia	1·360 „
„ of strontia	0·007 „
„ of iron	0·020 „
„ of manganese	0·006 „
Phosphate of lime	0·001 „
„ of alumina	0·002 „
Fluoride of calcium	0·024 „
Silex	0·570 „
	41·880 grs.

Analysis of the Elisabethquelle, Homburg.

TEMPERATURE, 54½° FAH.

In 16 fluid ounces there are contained :

Chloride of sodium	79·15 grs.
„ of magnesium	7·76 „
„ of calcium	7·75 „
Sulphate of soda	0·38 „
Carbonate of lime	10·98 „
„ of magnesia	2·01 „
„ of iron	0·46 „
Silica	0·31 „
Total solids	109·20 grs.
Free carbonic acid	48½ cub. in.
Specific gravity	1·0115

Analysis of the Kreuzbrunnen Spring, Marienbad.

TEMPERATURE, 53¾° FAH.

In 16 fluid ounces there are contained :

Sulphate of soda	38·11 grs.
Chloride of sodium	13·56 „
Carbonate of soda	7·13 „
„ of lime	8·93 „
„ of magnesia	2·71 „
„ of iron	0·17 „
„ of manganese	0·03 „
„ of lithia	0·11 „
Silex	0·38 „
Total	66·13 grs.
Carbonic acid gas	8½ cub. in.

Analysis of the Rakoczy Spring, Kissingen.

TEMPERATURE, 52¼° FAH.

In 16 fluid ounces there are contained:

Chloride of sodium	62·05 grs.
„ of potassium	0·91 „
„ of magnes.	6·85 „
Bromide of magnes.	0·70 „
Carbonate of soda	0·82 „
„ of lime	3·55 „
„ of magnes.	2·50 „
„ of iron	0·68 „
Sulphate of soda	2·00 „
„ of lime	2·50 „
Phosphate of soda	0·17 „
Silica	2·25 „
Oxide of alum	0·18 „
Organic extract	0·15 „
Loss, nearly	0·38 „
Total	85·69 grs.
Carbonic acid gas	26·25 cub. in.

Analysis of the Mineral Water of the chief Spring at Wildbad, Würtemberg.

TEMPERATURE, 98° FAH.

In each 16 fluid ounces there are contained, together with small amounts of carbonic acid, nitrogen, and oxygen:

Chloride of sodium	1·82 gr.
Carbonate of soda	0·53 „
„ of lime	0·34 „
„ of magnesia	0·07 „
„ of iron	0·02 „
„ of manganese	0·02 „
Sulphate of soda	0·40 „
„ of potash	0·02 „
Silex	0·39 „
	3·61 grs.

Analysis of the Water of the Hauptquelle, the most saline of the Teplitz Springs.

In one litre is contained:

Carbonate of soda	0·384 gr.
„ of lime	0·042 „
Chloride of sodium	0·056 „

with traces of iron, manganese, magnesia, and silica.

Analysis of one of the Gastein Springs.

TEMPERATURE, 97° FAH.

In 16 fluid ounces there are contained:

Sulphate of soda	1·51 gr.
Chloride of sodium	0·36 „
Carbonate of lime	0·36 „
„ of iron	0·05 „
Silex	0·24 „

with a small quantity of sulphate of potash, carbonate of soda, of magnesia, and glairine, amounting together to 2·73 grains in 16 ounces.

Analysis of the Waters of Pfeffers, which are conveyed by a wooden pipe to Ragatz.

TEMPERATURE, 100° FAH.

In 16 fluid ounces there are contained:

Carbonate of magnesia	0·87 gr.
„ of lime	0·32 „
Sulphate of soda	0·62 „
„ of lime	0·37 „
Chloride of sodium	0·21 „
„ of magnesium	0·16 „
Total	2·55 grs.

With a very minute quantity of iron.

Gaseous contents:—Oxygen	1·3 cub. in.
Nitrogen	3·7 „ „
Carbonic acid	4·15 „ „

Analysis of the Buxton Waters (Playfair).

An imperial gallon at 60° Fah. contains:

Silica	0·666 grs.
Oxide of iron and alumina	0·240 „
Carbonate of lime	7·773 „
Sulphate of lime	2·323 „
Carbonate of magnesia	4·543 „
Chloride of magnesium	0·114 „
„ of sodium	2·420 „
„ of potassium	2·500 „
Fluorine (as fluoride of calcium)	trace
Phosphoric acid (as phosphate of lime)	trace
	20·579 grs.
Carbonic acid	15·66 cub. in.
Nitrogen	206·00 „

Analysis of the Buxton Waters, 1860 (*Dr Muspratt*).

Carbonate of lime	8·541	grs.
„ of magnesia	3·741	„
„ of protoxide of iron	0·082	„
Sulphate of lime	0·331	„
Chloride of calcium	1·227	„
„ of magnesium	0·463	„
„ of sodium	2·405	„
„ of potassium	0·260	„
Silica	1·044	„
Nitric acid	trace	
Organic matter	0·341	„
Fluoride of calcium	trace	
Phosphate of lime	trace	
Total per gallon	18·435	grs.
Free carbonic acid	3·5	cub. in.
Nitrogen	504·0	„

Analysis of the Bath Waters.

TEMPERATURE, 109° TO 117° FAH.

One pint of the waters contains:

Chloride of calcium	2·72	grs.
„ of magnesium	0·74	„
Sulphate of soda	3·48	„
Carbonate of soda	0·60	„
Sulphate of lime	6·65	„
Silica	0·35	„
Carbonate of iron	0·054	„
Loss	0·34	„

Besides an inch of carbonic acid and a large quantity of nitrogen.

Analysis of the Kaiserquelle (Source de l' Empereur), Aix-la-Chapelle.

TEMPERATURE, 135° FAH.

In 16 fluid ounces there are contained:

Chloride of sodium	20·71	grs.
Carbonate of soda	6·61	„
„ of lime	0·23	„
„ of magnesia	0·15	„
„ of strontia	0·04	„
Sulphate of soda	2·12	„
Sulphuret of sodium	0·62	„
Phosphate of soda	0·14	„
Fluoride of calcium	0·47	„
Silica	0·54	„
Organic animal matter	0·29	„
	31·92	grs.
Carbonic acid	8·00	cub. in.
Sulphuretted hydrogen	0·13	„
Nitrogen	18·53	„

Analysis of the Sulphur Spring at Aix-les Bains.

TEMPERATURE, 113° FAH.

In 1000 grains of water there are contained:

Nitrogen	0·03204 gr.
Free carbonic acid	0·02578 „
Free sulphuretted hydrogen	0·04140 „
Silex	0·00500 „
Phosphate of alumina	0·00249 „
„ of lime	
Fluoride of calcium	
Carbonate of lime	0·14850 „
„ of magnesia	0·02587 „
„ of iron	0·00886 „
„ of strontia	traces
Sulphate of soda	0·09602 „
„ of lime	0·01600 „
„ of magnesia	0·03527 „
„ of alumina	0·05480 „
„ of iron	traces
Chloride of sodium	0·00792 „
„ of magnesium	0·01721 „
Alkaline iodides	traces
Glairine	indeterminate quantity
Loss	0·01200 „
Total in 1000 grains	0·43000 gr.

Analysis of the Water of Marlioz, about a mile from Aix-les-Bains, which are frequently taken internally.

TEMPERATURE, 57° FAH.

In 1000 grains of water there are contained:

Sulphuretted hydrogen	6·70 grs.
Carbonic acid	4·64 „
Iodine	0·0001944 gr.
Bromine	0·0000515 „
Sulphide of sodium	0·067 gr.
Sulphate of soda	0·025 „
„ of lime	0·002 „
„ of magnesia	0·018 „
Chloride of sodium	0·018 „
„ of magnesium	0·014 „
Carbonate of lime	0·186 „
„ of magnesia	0·012 „
„ of soda	0·040 „
Silex	0·006 „
Carbonate of iron	0·013 „
„ of manganese	0·001 „
Sulphate of iron	0·007 „
Glairine	indeterminate quantity
Loss	0·017 „
Total	0·426 gr.

Analysis of the chief Spring at Challes, near Chambéry, a water frequently taken at Aix-les-Bains.

TEMPERATURE, 53° FAH.

In 1000 grains of water there are contained :

Volatile principles	slight traces
Nitrogen	
Fixed principles :—	
Chloride of magnesium	0·0100 gr.
„ of sodium	0·0814 „
Bromide of sodium	0·0100 „
Iodide of potassium	0·0099 „
Sulphide of sodium	0·2950 „
Anhydric carbonate of soda	0·1377 „
„ sulphate of soda	0·0730 „
Sulphate of lime	
Carbonate of lime	0·0410 „
„ of magnesia	0·0430 „
„ of strontia	0·0300 „
Phosphate of alumina and lime	0·0580 „
Silicate of alumina and lime	
Sulphate of iron and manganese	0·0015 „
Glairine	0·0221 „
Free soda	sensible traces
Loss	0·0325 „
Total	0·8451 gr.

Analysis of the Water of Barèges (Hautes Pyrenées).

TEMPERATURE FROM 86° to 111° FAH.

A quart of water contains 3·18 grains of solid constituents, viz :—

Sulphate of soda	0·64 gr.
Sulphuret of sodium	0·77 „
Chloride of sodium	0·61 „
Silica	1·0 „
Lime	0·03 „
Caustic soda	0·07 „
Caustic potash	traces
Ammonia	
Barègine	

And 0·24 cubic inch of nitrogen.

Analysis of the Waters of Bagnères-de-Luchon (Haute Garonne).

AVERAGE TEMPERATURE, 106½° FAH.

A quart of water contains 3·58 grains of solid constituents, viz:—

Sulphuret of sodium	0·47 gr.
„ of iron	0·03 „
„ of manganese	0·01 „
Chloride of sodium	1·11 „
Sulphate of potash	0·07 „
„ of soda	1·00 „
„ of lime	0·61 „
Silicate of alumina	0·13 „
Free silica	0·15 „

Analyses exhibiting the Influence of the Wiesbaden Water upon the Urinary Secretion (Braun).

A man about thirty years old and in good health was put upon a regulated and meagre diet, taking equal and moderate exercise. On the fourth day the urine was collected and examined:—

The quantity in the 24 hours was	45 ozs. (by weight)
Urea	112·19 grs.
Uric acid	13·15 „
Chloride of sodium (common salt)	171·69 „

When an additional half pound of ordinary water was next day added to his diet, the results were:—

Quantity of urine in the 24 hours	51 ozs. (by weight).
Urea	119·42 grs.
Uric acid	13·61 „
Chloride of sodium	173·51 „

Next day half a pound of Wiesbaden water was substituted for the ordinary water, with the following results:—

Quantity of urine in the 24 hours	66 ozs. (by weight).
Urea	221·73 grs.
Uric acid	20·74 „
Chloride of sodium	204·12 „

A second trial of the same experiment gave

Quantity of urine in the 24 hours	63 ozs. (by weight).
Urea	186·91 grs.
Uric acid	16·14 „
Chloride of sodium	221·31 „

It is stated that in other trials the augmentation of the urine varied from twelve to twenty ounces, and that the urea, uric acid, and common salt were also increased in the same proportion.

Effects of the mineral waters when taken in larger but moderate doses.—The subject of the above experiment was again selected, and the same diet persevered with; a pound of common water was added to his diet on the fourth day, and the quantity and composition of the urine was as follows:—

Quantity of urine in the 24 hours	61 ozs. (by weight).
Urea	166·91 grs.
Uric acid	14·04 „
Chloride of sodium	201·71 „

The next day, a pound of the mineral water was taken in the course of from half to three-quarters of an hour, and the

Quantity of urine in the 24 hours was	76 ozs. (by weight).
Urea	246·354 grs.
Uric acid	23·712 „
Chloride of sodium	249·31 „

In three other trials, the urine varied in quantity from seventy to eighty-five ounces, the urea from 247 to 265 grains, the uric acid from nineteen to twenty-eight grains, and the chloride of sodium from 263 to 320 grains. Only one experiment is given by Dr. Braun on the effect produced on the urine by the waters, when taken in very large doses.

Quantity of urine in the 24 hours	48 ozs. (by weight).
Urea	114·12 grs.
Uric acid	12·91 „
Chloride of sodium	226·11 „

In another observation the quantities only of the urine were determined, and found to be fifty-three and fifty-one ounces respectively.

The physiological effects produced by the use of these waters, in the form of either the tepid or warm bath, appear to be the same as those induced by a mixture of common and sea water, and I believe that no real difference could be distinguished between the effects of the one and the other.

Effects of tepid baths on the urine.—Dr. Braun has also given in his work the effect of these baths on the urine, choosing for the observations a man, previously prepared by a regulated diet, and moderate exercise. On the three days of this diet, the examination of the urine gave the following results:—

Quantity of urine passed in the 24 hours	48 to 54 ozs. (by weight).
Urea	110 to 138 grs.
Uric acid	11 to 13 „
Chloride of sodium	160 to 176 „

The next day, when taking a bath of ordinary water of half an hour's duration, at the temperature of about 90° Fah., the numbers were,—

Quantity of urine in the 24 hours	39 ozs. (by weight).
Urea	141·32 grs.
Uric acid	14·81 „
Chloride of sodium	174·11 „

On the following day, a bath of the mineral water was taken at about the same temperature and of the same duration, and the effects on the urine are seen to be,—

Quantity of urine in the 24 hours	56 ozs. (by weight).
Urea	181·90 grs.
Uric acid	13·01 „
Chloride of sodium	169·44 „

Repetitions of the experiment gave,—

Quantity of urine in the 24 hours	58 ozs. (by weight).
Urea	121·31 grs.
Uric acid	16·02 „
Chloride of sodium	234·12 „

Analyses exhibiting the Influence of Wiesbaden Waters upon the Urinary Secretion (Neubauer).[*]

The results of Neubauer, referred to at page 416, differing completely from those given above, will be seen in the following Table, in which the amounts of uric acid contained in the 24 hours' urine are indicated.

	Minimum.	Medium.	Maximum.
FIRST INDIVIDUAL.			
α Living as usual (5 days) . .	0·31 grs.	4·32 grs.	9·41 grs.
β Taking a bath of warm water each day for half-an-hour, at 82° Fah. (5 days) . . .	5·56 „	6·79 „	8·18 „
γ Bath as before, in addition to which about 17 or 18 fl. ozs. of Wiesbaden water (Kochbrunnen) (7 days) . . .	2·01 „	4·17 „	7·72 „
SECOND INDIVIDUAL.			
1. Living as usual (8 days) . .	5·09 „	7·56 „	10·34 „
2. Living as β, first individual (5 days)	7·10 „	9·26 „	12·50 „
3. Living as γ, first individual (8 days)	4·68 „	7·87 „	10·34 „

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[*] Extracted from Thudicum's Work on Urine.

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